FOOD ENGINEERING

A McGRAW-HILL PUBLICATION • FORMERLY FOOD INDUSTRIES

June 1953

35 CENTS

INGREDIENT INSERT
ALSO IFT SHOW GUIDE

INGREDIENTS are evaluated for quality improvement in this lab. Leavener is being tested. (Page 68)

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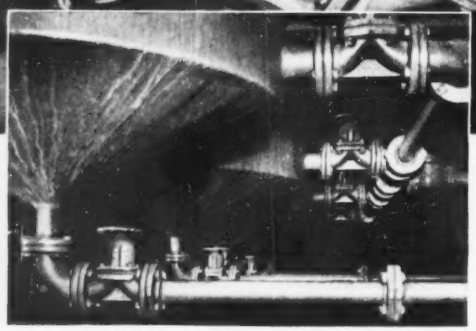
Use the Free
READER SERVICE

. . . for help on your job. It brings needed data on equipment, ingredients, supplies—also useful catalogs. As you read this issue, circle page numbers on

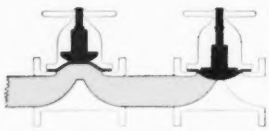
Coupon, Page 201

Found on the REALLY TOUGH JOBS

The most troublesome part of sewage treatment, a difficult service at best, is final disposal of sludge. Shown here in the Houston, Texas sludge disposal plant are two chain-wheel operated, 10-inch, rubber lined Grinnell-Saunders Valves, with neoprene diaphragms, handling filtrate from vacuum filters with a PH of 3.5 to 4. This filtrate is a 2% to 3% solution of Ferric Chloride on a 15" to 20" vacuum. Temperature is atmospheric.



◀ In same plant. Eight 3-inch rubber lined Grinnell-Saunders Diaphragm Valves, handling 8% to 10% Ferric Chloride, at atmospheric temperature



OPEN CLOSED

GRINNELL-SAUNDERS DIAPHRAGM VALVES

Streamlined flow. Smooth, streamlined passage, without pockets, prevents trapping of solids. Frictional resistance is at a minimum — regardless of direction of fluid flow. No disc holder in fluid stream.

Leak-tight closure against grit, scale, suspended solids. The resilient diaphragm, plus the large area of contact, gives leak-tight closure against pressure or vacuum.

Working parts absolutely isolated from fluid. Diaphragm completely seals off working parts from fluid in the line. No sticking, clogging or corroding of working parts. Valve lubricant cannot contaminate fluids.

Body, lining and diaphragm materials to meet service condition. Bodies stocked in cast iron, malleable iron, stainless steel, bronze and aluminum; other materials on special orders. Valve bodies lined with lead, glass, natural rubber or neoprene. Diaphragm materials of natural rubber or synthetics.

Minimum maintenance. No refacing or reseating is required. No packing glands to demand attention. New diaphragm can be inserted without removing valve body from the line.

GRINNELL

WHENEVER PIPING IS INVOLVED

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Food Engineering

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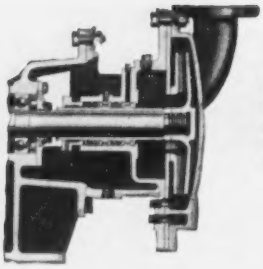
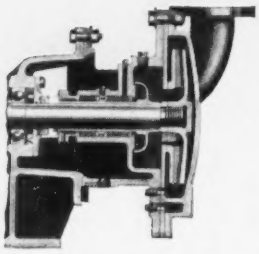


Standard Stuffing Box — for suction lift. Stuffing box on the suction side limits pressure on packing to suction pressure. Under suction lift conditions, the liquid being pumped does not enter the stuffing box.

ALLIS-CHALMERS

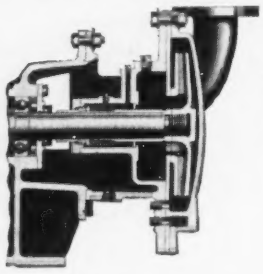
PROCESS PUMPS

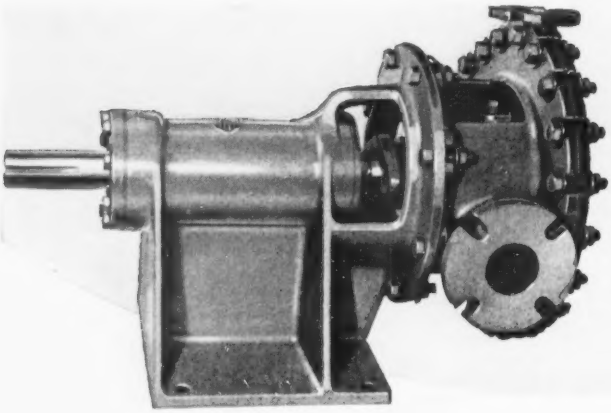
VERSATILITY that Cuts Your Pumping Costs



***Equiseal* Stuffing Box — for suction heads to 15 feet.** The *Equiseal* stuffing box is equipped with an auxiliary impeller which produces a low pressure area in front of the packing. This low pressure area prevents the liquid being pumped from entering the packing on suction heads up to 15 feet at 1750 rpm.

Mechanical Seal — for suction heads over 15 feet. The Allis-Chalmers Process Pump may be fitted with a variety of mechanical seals for conditions where the suction head exceeds 15 feet. Each application is individually engineered.





YOU CAN HANDLE A WIDE RANGE of products with one type of pump when it is an Allis-Chalmers Type P Process Pump. Each of the three sealing methods shown here is interchangeable on any Type P pump with a minimum of alteration to the pump itself. No new major parts or permanent alterations are required to use any of these sealing methods.

CHOICE OF MATERIALS

The Allis-Chalmers Process Pump is available in a wide choice of materials to handle many combinations of abrasiveness and corrosiveness in the liquid to be pumped. Usual materials include aluminum bronze, *Ni-Resist*, 316 stainless steel, and 18% chrome steel, plus almost any special material which may be required, including non-machinable alloys. Parts subject to varying rates of wear are separated for easy replacement.

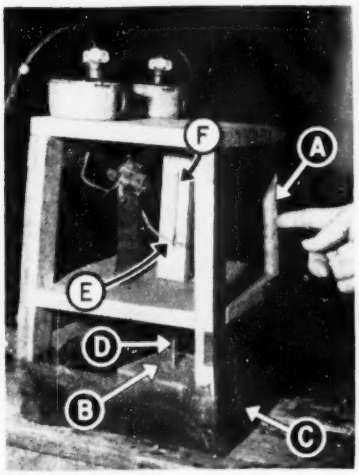
GET DETAILS

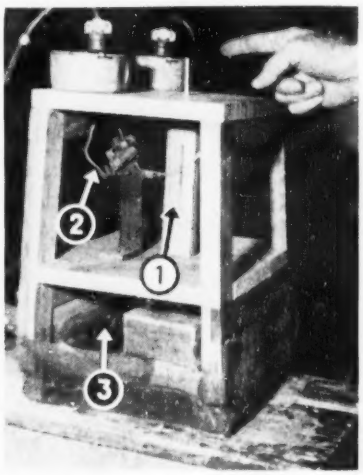
For complete details on the Allis-Chalmers Process Pump plus competent engineering assistance, call your nearby Allis-Chalmers District Office. Or write Allis-Chalmers, Milwaukee 1, Wisconsin for Bulletin 52B6615. A-3902

Equiseal is an Allis-Chalmers trademark.

ALLIS-CHALMERS

PRACTICAL IDEAS





Homemade Sump-Pump Self-Starter

Bucketing-up water, resulting from coil-defrosting, and then mopping up a basement passageway, was a regular, time-consuming Monday-morning task, until we engineered a simply-constructed contraption for removing defrosting water as it collected. Other alternative, installation of a sewer outlet in this area, would have been a major project entailing costly construction.

Our wine cooling, for tartrate percipitation, is conducted in an insulated room separated from rest of plant. Defrosting of coils in this cooler is readily accomplished over week-ends when tanks are empty, by closing valves supplying refrigerant and opening door to cooler (see left photo).

Snow, melted by heat from warm basement, turns to water, flows out door and onto a depressed, heavy-traffic runway. Here water would accumulate as a small lake but for automatic sump-type pumping device. Before closing time at end of each week, latter is placed in lowest area of passageway and connected to pump and electric circuits.

This is how automatic unit is constructed and how it operates.

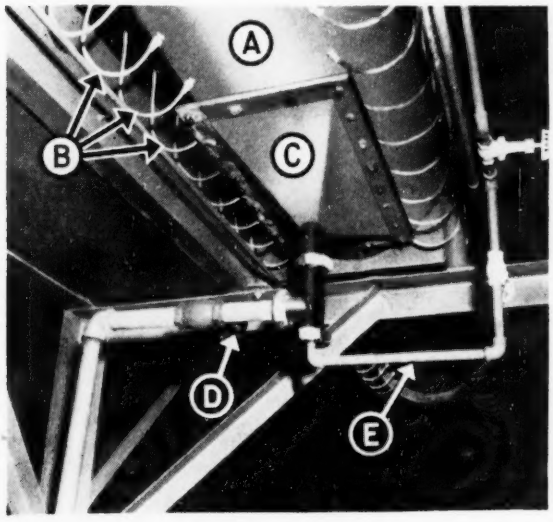
To avoid possibility of short circuits, stool-like frame—(A) in center photo—is built of wood. Until raised by accumulation of water, float (B), a hollow, flat bottomed, metal box, rests on screen (C) which encloses bottom and lower portion of stool.

Elevated as level of water rises, float lifts rod (D) to which it attached a wire loop (E), extending through slot (F) in wood upright.

Through loop (and raised and lowered by it) extends pivoted lever arm—(1) in right photo—on end of which is mounted a mercury switch (2).

Now, as float rises, tilting of switch allows mercury to flow, making contact across switch outlets. Closing switch actuates pump motor. Pump suction then draws water from inside of wire screen enclosure through hole (3) in frame near base.

As water level is lowered in the depression, float is lowered, reversing tilt of switch to break circuit and stop pump. Since, as rapidly as formed, melted coil-frost is pumped to a sewer outlet, passageway is dry and safe for pedestrian traffic on Monday morning.—*Marshall Frink, Maintenance Dept., Garrett & Co., Brooklyn.*



Continuous Cooker Efficiency Upped

A few simple devices, resulting from our own ideas and constructed in our machine shop, have definitely improved efficiency of our continuous cooker and bettered product quality.

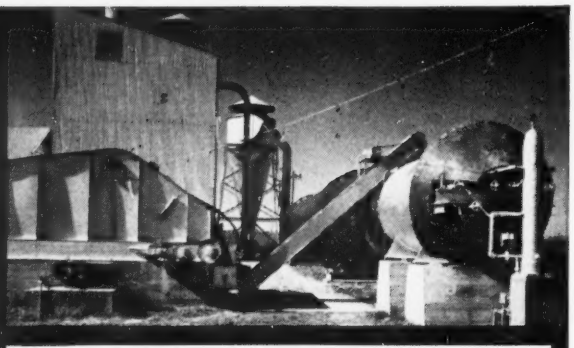
Purpose of unit is dual: to cook fruits or vegetables and to reduce them to pulp-like consistency in preparation of suitable food for infant feeding.

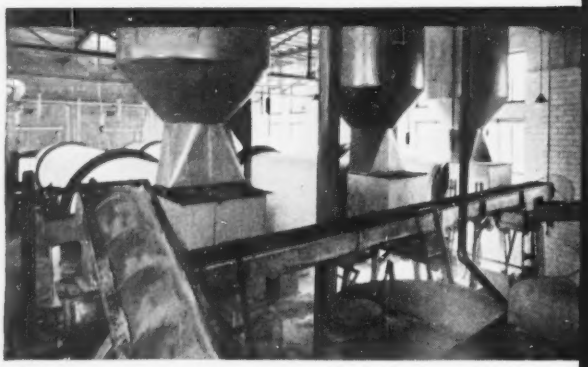
Originally, heat transfer was through hollow screw which slowly moves product through the 80 ft. long cooker—(A) in photo—from feed to discharge end. Even though occasional scorching on surface of steam-heated screw conveyor was slight, it was sufficient to detract from required quality.

Overheating and scorching were overcome when steam-heating scroll was discontinued in favor of injecting live steam through a series of tubes (B) piped at regular interval through bottom on both sides of conveyor housing.

Regardless of initial moisture content of fruit or vegetable, each finished product is processed to predetermined viscosity. To insure against excess moisture caused by

more than 50 years of experience in designing and building dryers for industry...





Louisville dryers

used throughout the world for great efficiency with low maintenance

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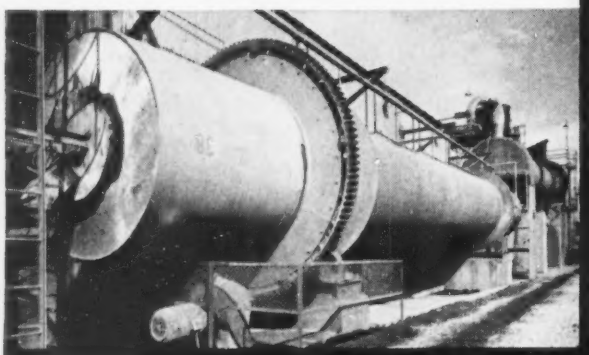
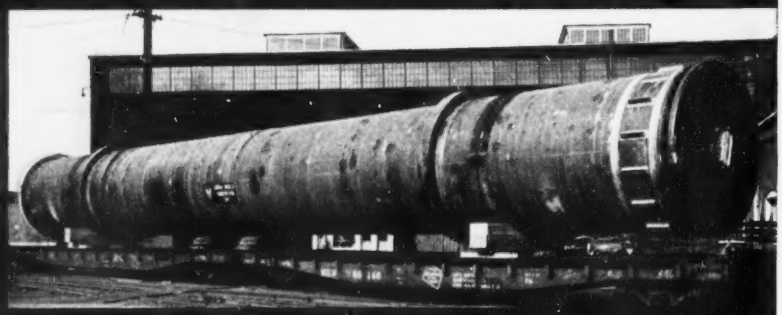
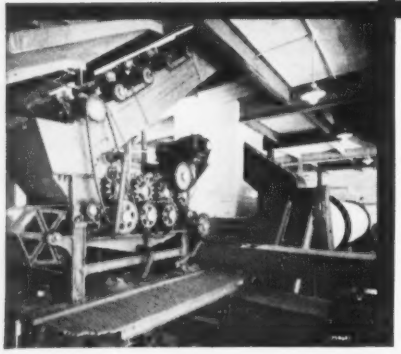


PROCESS EQUIPMENT DIVISION
GENERAL AMERICAN
TRADE MARK

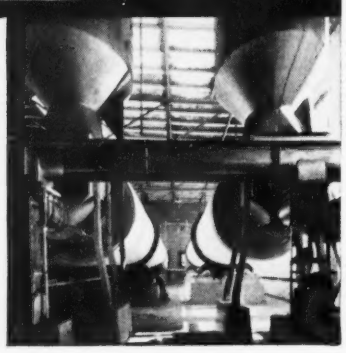




KNOW THE RESULTS BEFORE YOU BUY

Louisville engineers will test your dryer needs in our laboratory. When required, a pilot model will be checked in your plant before full-size dryers are built.

Louisville's creative engineering pre-determines results for you!



condensation of cooking steam, condensate separators (C) were installed. Each of these reverse-pyramid-shaped attachments on cooker bottom are provided with fine-mesh strainers permitting removal, as desired, of liquid from product, but prevent escape of pulpy product. Liquid is drained by opening valve (D).

In event a screen should become coated sufficiently to interfere with drainage, clogging surface layer can be removed by steam injected through pipe (E) up into drain chamber and against screen.

Not only have improvements on cooker eliminated danger of overcooking and scorching but, they have also provided an accurate method for controlling product viscosity.—*C. M. Coywood, Gerber Products Co., Freemont, Mich.*

$50 Extra for Best Item

You are invited to submit Practical Ideas. You will be paid at regular rates when your item is printed and if it is judged best for the month you will get an additional payment of $50.

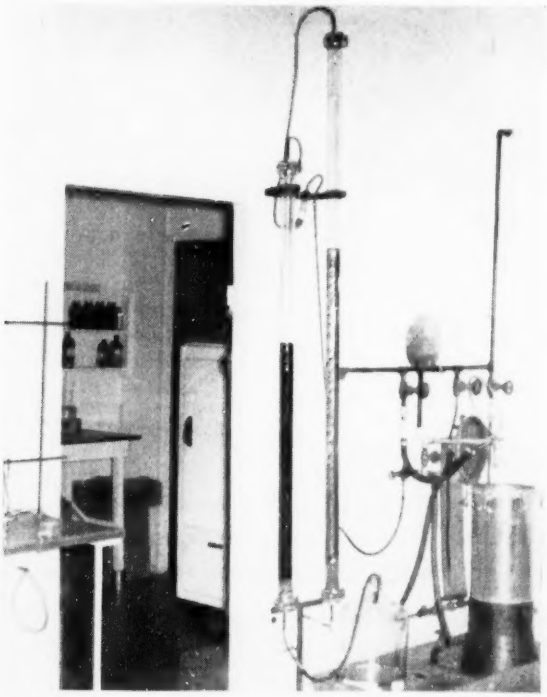
Selection of the best contributed item will be made by a group of 200 readers each month, and the item title and author's name will be cited (see below).

Practical Ideas may describe any type of device or method recently developed to solve a problem, speed an operation, or make some task easier. They may concern factory, laboratory, warehouse, or power-plant operations in the food industry. Ideas on management, maintenance, and trucking or shipping also are suitable.

You need not be an experienced writer or draftsman to submit these ideas. The text will be edited and sketches converted to finished drawings.

Send your items to: Practical Ideas Editor, FOOD ENGINEERING, 330 W. 42nd St., New York 36, N. Y.

APRIL PRACTICAL IDEA voted best was "Hardwood Floors Waterproofed," submitted by W. A. Free, Jr., Hungerford Packing Co., Hungerford, Pa. It told how heavy canvas impregnated with a rubber-base paint provided excellent protection for a fine wood flooring in an area taken over for food processing work.



Make Your Own Ion Exchange

Water demineralizer we now use in our laboratory was easily fabricated from odd and ends.

Preparing distilled water on a small scale by steam distillation, was found to be a time-consuming operation. Present method employs an ion-exchanger of our own design and is speedy, efficient and requires scant attention.

This is how we constructed water demineralizer:

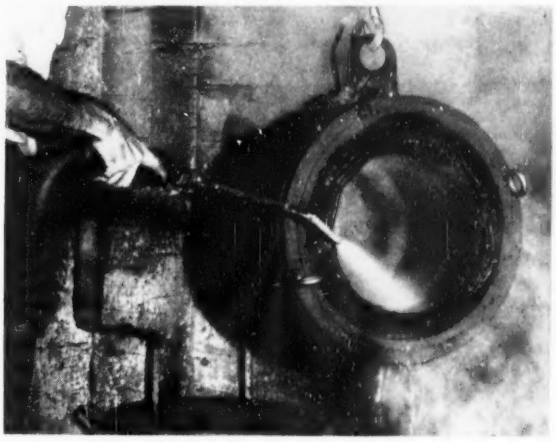
Into bottom of reaction columns, each made from a length of glass pipe (see photo), stainless steel sponges are inserted to prevent escape of ion exchange resins.

To conventional rubber-gasket-sealed glass pipe connectors, stainless steel plates with ¼ in. tube vents are attached. Hose is connected to vent pipes to direct flow of water through assembly.

In hose line from raw water supply to first exchanger, a simple sand filter is inserted to strain out scale or foreign material which might contaminate exchange beds. Filter is a bent glass adapter half-filled with sand, resting on a stainless steel sponge forced into restricted end.

Exchange materials are conventional resins, regenerated by passing through hydrochloric acid and sodium carbonate. Through these beds of exchange resins, 0.06 cu. ft. each, as much as 500 gal. of water can be purified between regenerations.

Purification rate is 12 qts. per hr.—*W. E. Anderson and L. V. Savino, Quality Control Department, Hanover Canning Co., Hanover, Pa.*



Food Plant Motors Easily Cleaned

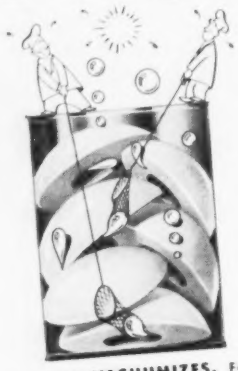
A simple and relatively inexpensive method for cleaning motors, devised in our plant, has been successfully applied to free more than 3000 motors of harmful materials.

Using an injector-type heater, water under pressure is delivered at 212 deg. F. from a nozzle and directed onto windings. When necessary a detergent is syphoned into hose stream through a section T.

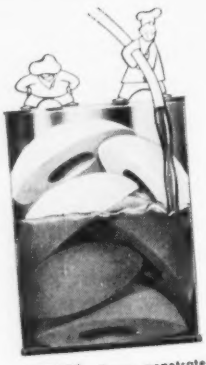
When material to be removed from inside of motor is

Announcing the New

PRE-VACUUMIZING SYRUPER

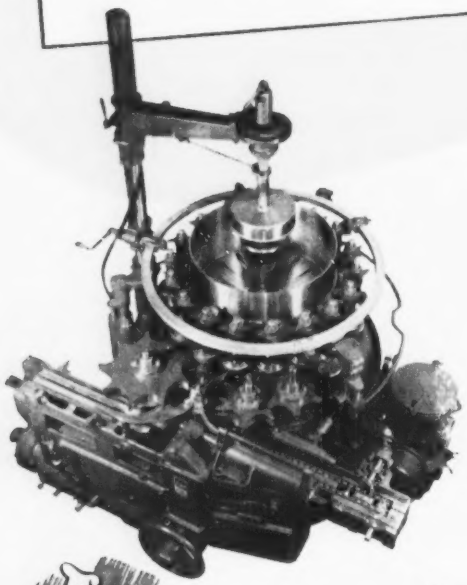


1 PRE-VACUUMIZES. Free and entrapped air is quickly removed from can and product cavities.



2 SYRUPS. Syrup penetrates rapidly and uniformly throughout the can.

3 FINAL VACUUMIZING AND CONTROLLED FILLING. All residual air is released, every can is accurately syruped to a positive head space.



Now You Can Syrup and Vacuumize a Host of Canned Food Products on *One* Compact Machine— *To a Uniform Fill, at High Speed and Low Cost*

The new precision-built 18 valve FMC filler greatly steps up operating efficiency in the canning of quality fruits and vegetables. This equipment combines vacuumizing and syruping operations in one compact unit, to meet the most rigid requirements for high-speed, thorough syrup penetration and complete release of entrapped air. Filled cans are conveyed directly from syruper to the closing machine. Every can is syruped to an accurate head space level for complete uniformity. Spillage and waste are eliminated by the well-known FMC "No can—No fill" mechanism. Polished stainless and alloy contact parts resist wear, are easily accessible for cleaning and maintenance, and provide highest standards of sanitation.

The FMC No. 18 Pre-Vacuumizing Syruper smoothly handles can sizes from 211 to 404 diameter, 300 to 704 height—at speeds up to 275 cpm, depending on can size.

Plan to get *all* the facts on this equipment *today!*

Write for new bulletin, or call your nearest FMC representative.

FOOD MACHINERY AND CHEMICAL CORPORATION

Canning Machinery Division

General Sales Offices:

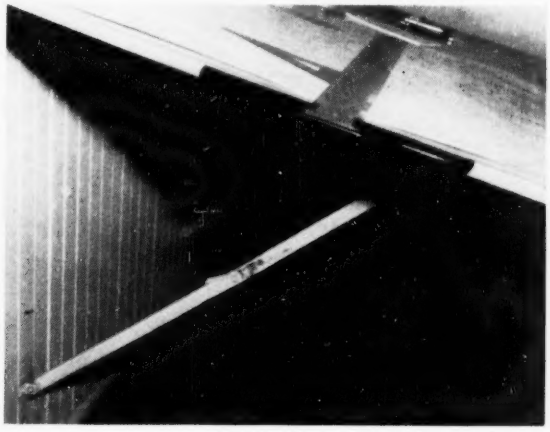
WESTERN: SAN JOSE 6, CALIFORNIA **EASTERN:** HOOPESTON, ILLINOIS

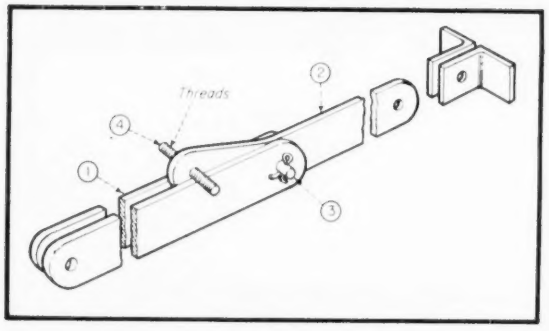
For more information, use coupon on page 201.

acid or alkaline, litmus may be applied to drippings after washing. After usual method of over-drying following washing, parts are varnished by vacuum method of impregnation.

Cleaning method is inexpensive and water, even with detergent added, does not act as solvent for winding varnish. Since water costs little, ample volume may be applied for thorough cleaning.

Our water is very soft and pure but some waters may require treatment to be satisfactory as motor wash water. —*Harry D. Jefferson, Electrical Engineer, Hawaiian Pineapple Co., Honolulu.*





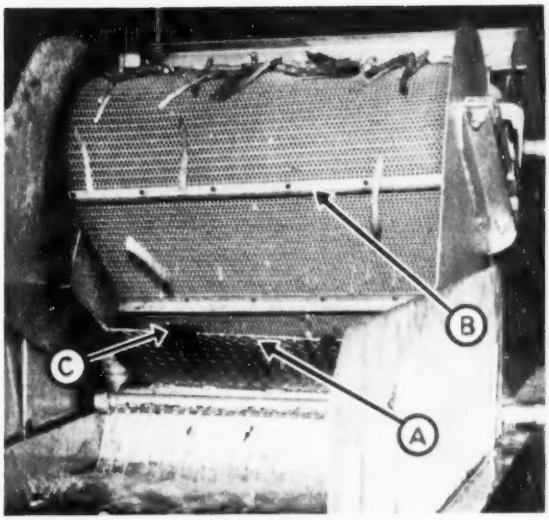
Secure Hinged-Table Support

From a few lengths of strap iron and a few bolts, it is easy to make non-collapse supports for hinged work-surfaces. And these can be manipulated to permit the table surface to swing on its hinges to the perpendicular, thus clearing the area when the table is not in use.

This is how the supports are made: Braces (see photo) are constructed in two sections, pivoted near the center. Lower section—(1) in sketch—is made of two metal straps. Upper length (2) is a single strap. Both are drilled for a pin (3) at the pivot point, the upper, single strap extending about 2 in. beyond the drilled hole.

Extended portion of strip is bent upward so that when tapped and threaded with a bolt (4), the latter will rest on the two lower straps, forming an upper angle between the two of slightly less than 180 deg.

Thus, the table supported by the braces cannot be lowered on its hinges as long as one of the supports is locked. This type brace provides safe support for hinged work surfaces along conveyors and elsewhere in food plants, especially in locations where it is necessary at times to clear the area of tables.—*Erik W. Holgren, Chief Engineer, Abbotts Dairies, Inc., Ice Cream Div., Philadelphia.*

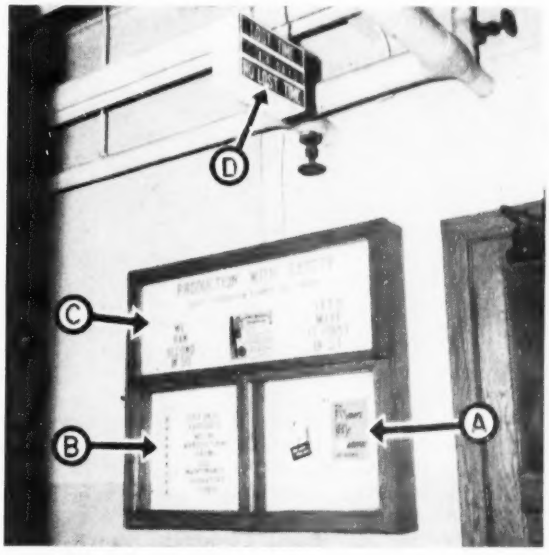


Unit Silenced by Belting Pads

Clank and vibration of metal flights of a woven-wire belt conveyor against a metal shield were ended when strips cut from "canner's belt" were attached to shield.

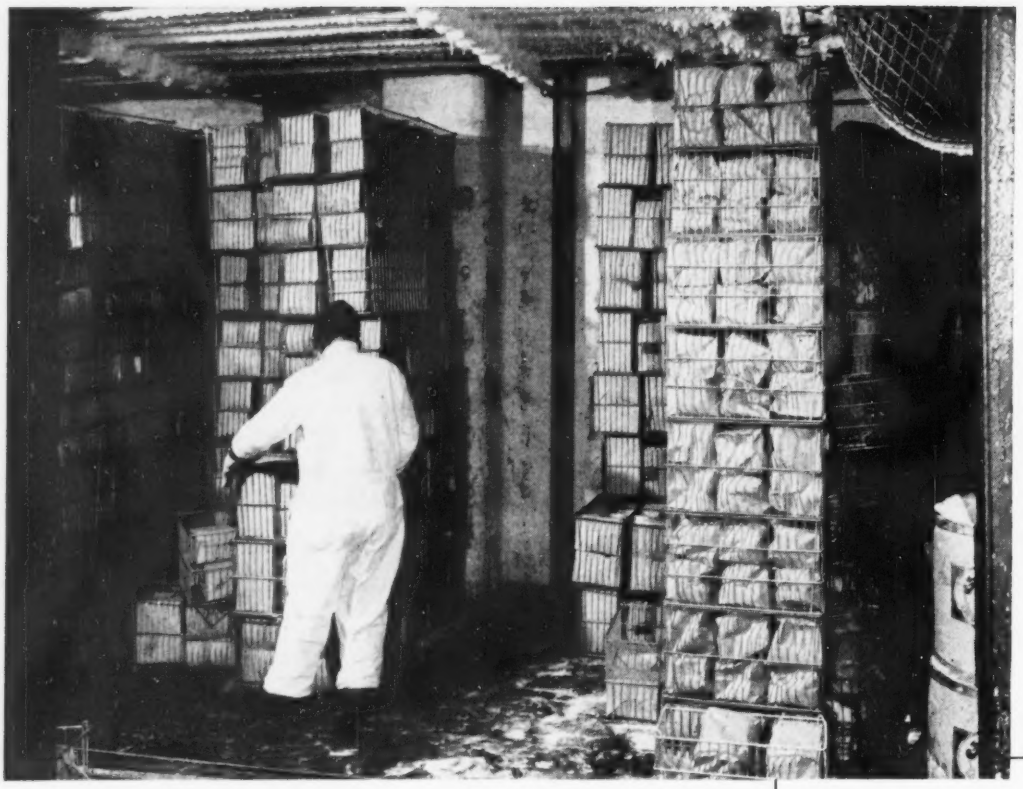
To prevent vegetables, transported between a first and second washer, from clinging to belt elevator instead of discharging into second washer, a plate—(A) in photo—was placed under conveyor to knock clinging product loose. Angle iron conveyor-flights (B) banged against plate, causing excessive vibration as well as jarring workers' nerves.

To relieve condition, strips of rubber belting (C) were folded over conveyor cleaning plate and secured with bolts. Both vibration and clanging ceased.—*L. M. Jordan and Dorsey Davis, Phillips Packing Co., Cambridge, Md.*



Aids That Advance Safety Program

In addition to accident prevention posters—(A) in photo—and standard methods for keeping workers conscious of ever present dangers of injury, we employ two devices of our own design which serve as competitive chal-



How long has corkboard helped hold this room at minus 30°?

There's plenty of life in corkboard insulation when it's properly installed.

Here, for example, is an ice cream hardening room at the Hendler Creamery Co., Baltimore, Md. In 1925, this room was insulated with 8" of Armstrong's Corkboard. Today, after 28 years of continuous operation at 20° to 30° below zero, the insulation is still intact, dry and doing its job efficiently. Mr. Albert Hendler, Vice-President, says that no insulation maintenance has been required, and he expects many more years of trouble-free service.

This job is not unusual. Hundreds of Armstrong installations are still performing at top efficiency after 20, 30, and even 40 years. It's service like this that has made Armstrong's Corkboard first choice of buyers who want the most profitable return on their insulation investment.

Call Armstrong whenever you need low-temperature insulation. Our contracting organization can take over the entire job and assure you an efficient, long-lasting installation. For further information on this complete service, call your near-by Armstrong office, or write Armstrong Cork Company, 2006 Seventh Street, Lancaster, Pennsylvania.

Complete Insulation Contract Service

There are many factors that can't be written into an insulation contract, but which can largely determine whether or not the agreement will be entirely satisfactory. They include:

1. Financial responsibility—resources to complete the contract despite any unforeseen events.

2. Integrity—a reputation for quality work and for prompt settlement of any justified complaints.

3. Technical ability — experience, plus technical and research staff to do the job in accordance with best practices.

4. Manpower resources — trained supervisors and workmen able to handle any contract efficiently.

5. Efficiency — ability to deal with problems of accounting, tax provisions, insurance, and workmen's compensation.

You get all these with an Armstrong Contract

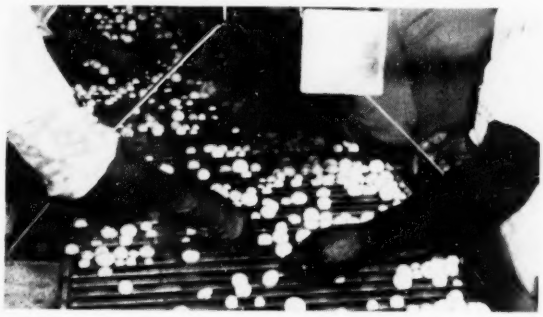
ARMSTRONG'S INDUSTRIAL INSULATIONS

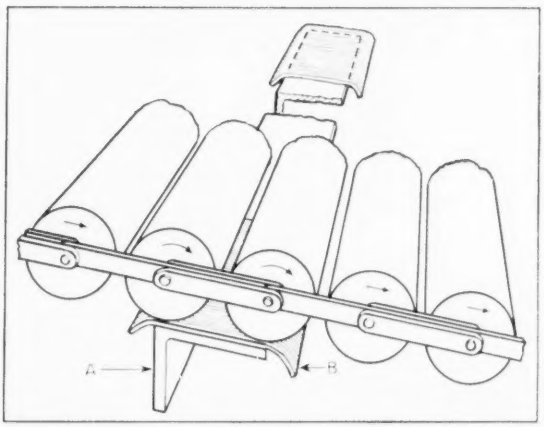
For temperatures from 300° below zero to 2800° F.

lenges as well as helpful reminders to be on the alert to prevent accidents.

From the records kept of all injuries, the lost-time-accident rating of each department in the plant is tabulated and posted (B) along traffic lanes. Displayed adjacent to the record of department standing (which stimulates competitive effort to avoid accidents), is our appeal to pride-in-plant group standing (C).

Each day workers can follow the all-plant standing recorded on lighted sign (D) which reports the number of consecutive days without time lost due to accident. A declining rate has been the response to these efforts.—*A. F. Wenske, Assistant Supt. of Maintenance, Eastern States Farmer's Exchange, Buffalo.*





Turns Product For Better Inspection

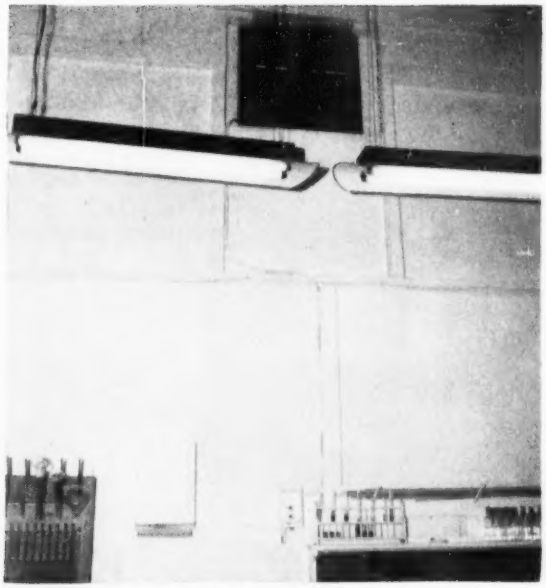
By adding a length of angle iron and two strips cut from a discarded canvas belt, a means was provided at our plant for turning mushrooms on conveyor so all sides may be inspected.

Product is carried past inspectors on closely spaced stationary rollers (see photo) attached to a traveling chain. Position of buttons would not be shifted for viewing all sides were it not for attachment.

This is way it is done:

A 1¼-in. T or angle-iron—(A in sketch)—is secured under conveyor with a horizontal surface parallel with rollers. At each end, a strip of belting (B) several inches wide and 6-8 in. long, is laid over angle-iron, hanging down on either side.

Cross-member is adjustable and can be elevated against rollers, causing each to turn about a half revolution while passing over belt strips. This gently tumbles mushrooms into a new position.—*Walter Blevins, Plant Superintendent Brandywine Mushroom Corp., West Chester, Pa.*

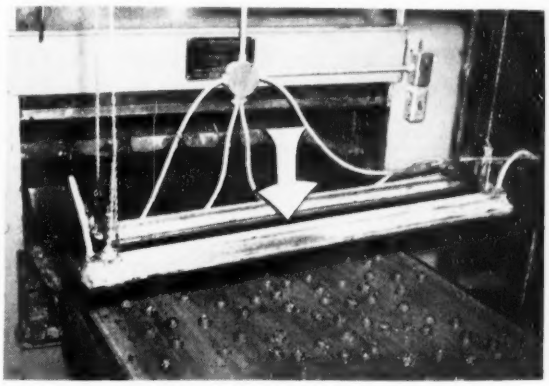


One Fan—Two Functions

Midsummer heat was excessive near our jelly and syrup cookers, elevated on a mezzanine-like platform. Plant laboratory in an adjacent room did not become so torrid, but ventilation was advisable.

These difficulties were easily overcome by locating a single exhaust fan (photo) near the ceiling in the common wall between laboratory and kitchen. Both areas can now be kept amply comfortable even during the hottest of the summer days.

Fan is ample to maintain air circulation in laboratory. The blast it discharges between rows of kettles dissipates kitchen heat to comfort level.—*Robert P. Korn, Plant Engineer, Henry & Henry Inc., Buffalo.*

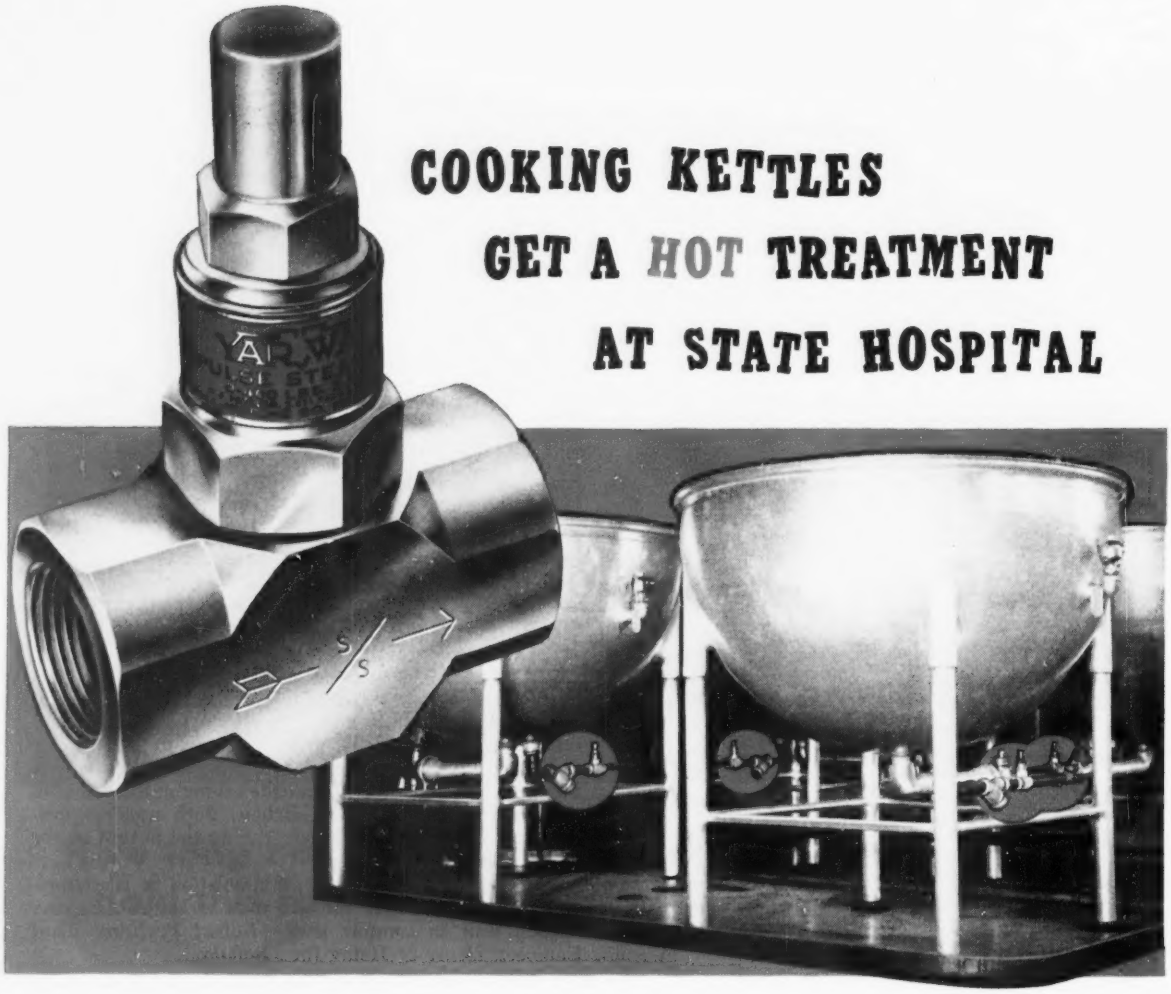


Radient Heat Improves Enrobing

Since installing two 39 in., 1800-watt, 230-volt radient heat units (see photo) at enrobers, Brock Candy Co., Chattanooga, Tenn., is now assured brighter, smoother coatings.

Formerly, chocolate had a tendency to set with porous irregular surface on cold centers. Now, however, with surface flash heated to 180 deg. F., not only does chocolate flow uniformly around center to form a smooth surface, but coating adheres tenaciously to centers.

COOKING KETTLES GET A HOT TREATMENT AT STATE HOSPITAL



Yarway Impulse Steam Traps have put new life in many a "sick", sluggish cooking kettle. In fact, they are "good medicine" for the profitable operation of steam equipment of all kinds because they get equipment hot in a hurry and keep it hot!

At the installation pictured above, in the kitchen of North Carolina State Hospital, Yarways have been doing a good job for over 10 years. Besides quick heating and sustained efficiency, the plant engineer reports "little if any service required."

Other Yarway features are small size, easy installation, light weight, stainless steel construction, only one moving part, good for all pressures.

When you consider that new Yarway Impulse Traps often cost no more than repairing ordinary steam traps, it makes them a doubly good investment.

See the nearest of more than 200 Industrial Distributors who stock and sell Yarways. For free 20-page Trap Selector write . . .

YARNALL-WARING CO. • 127 Mermaid Avenue, Philadelphia 18, Pa.

YARWAY

the steam trap designed with more production in mind

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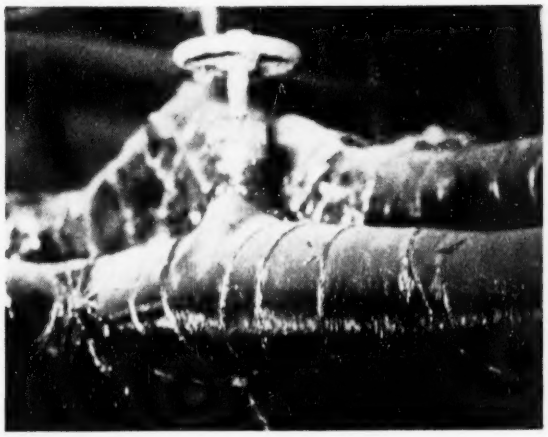
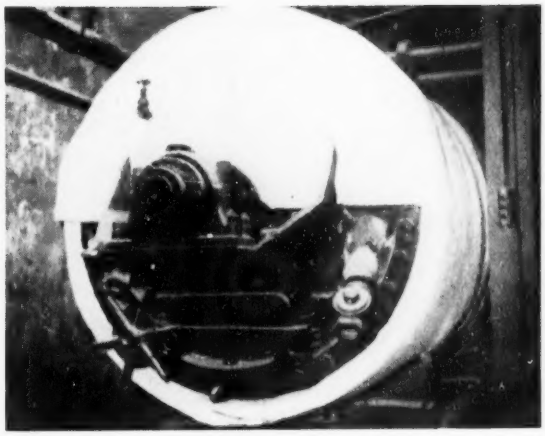




Glass Insulation Proved for Two Uses

Applying textile-type fibre insulation for both low and high temperature protection at our plant not only blocks heat loss as thoroughly as other types of insulating material but costs less and can be applied for a fraction of the cost of other types.

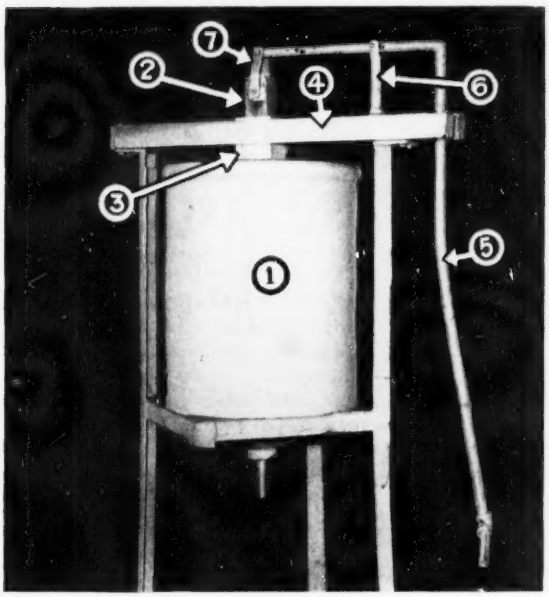
This is how glass insulation was applied on two small jobs and results obtained:

Two hundred fifty feet of pipe, size ½ to 1 in., 10 valves and 18 fittings on 20 deg. F. brine lines (see left photo) were first painted with tar lap cement, followed by a covering of 15-lb. felt paper and a 1-in. layer of Ultralite glass fiber. A second layer of felt and glass fiber were given a coat of 45-lb. tar-coated roofing paper, secured by twine.

Materials required were 400 sq. ft. of 1 in. insulation, 1 roll 15-lb. felt, 3 rolls 45-lb. roof paper, 18 balls of twine and 10 gal. cement. Material cost was $8.90. Results —efficient operation—no frost.

Next insulated were two 15-ft. long, 6 ft. diameter vats (see right photo) in which processing at 275 deg. F. is conducted.

For adequate protection against heat loss, a 2 in. layer of glass fibre was laid on and held in place by a jacket of 6 oz. canvas. Since vessels require access for frequent repair, no cement or binder was applied. Glass insulation is readily removed and reapplied.—*Francis Yost, Chief Engineer, Fried & Reineman Co., Pittsburgh.*



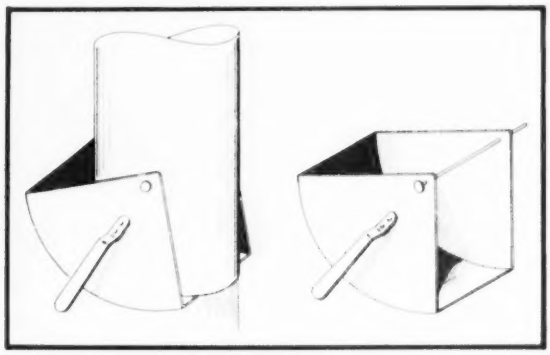
Homemade Liquid Filler

Using a 15-gal. cone-bottom stoneware jar, angle-iron, pipe, and a length of wood, we fabricated a hand-operated filler with a production rate of 50 cases of small bottles per hour. This is how unit was constructed and how it may be operated:

Jar—(1) in photo—with top 5 ft. 10 in. from floor is supported by an angle iron frame. An outlet valve (2), turned on lower end to fit outlet orifice, is made from a length of 2 by 2, extending from above frame to bottom of jar. It is held in vertical position by a wood housing (3), attached to a wood cross-frame (4).

Valve control lever (5) is made of ½ in. pipe, pivoted in upright pipe support (6), and is set between a pair of straps (7) attached to vertical wood cone-bottomed valve rod.

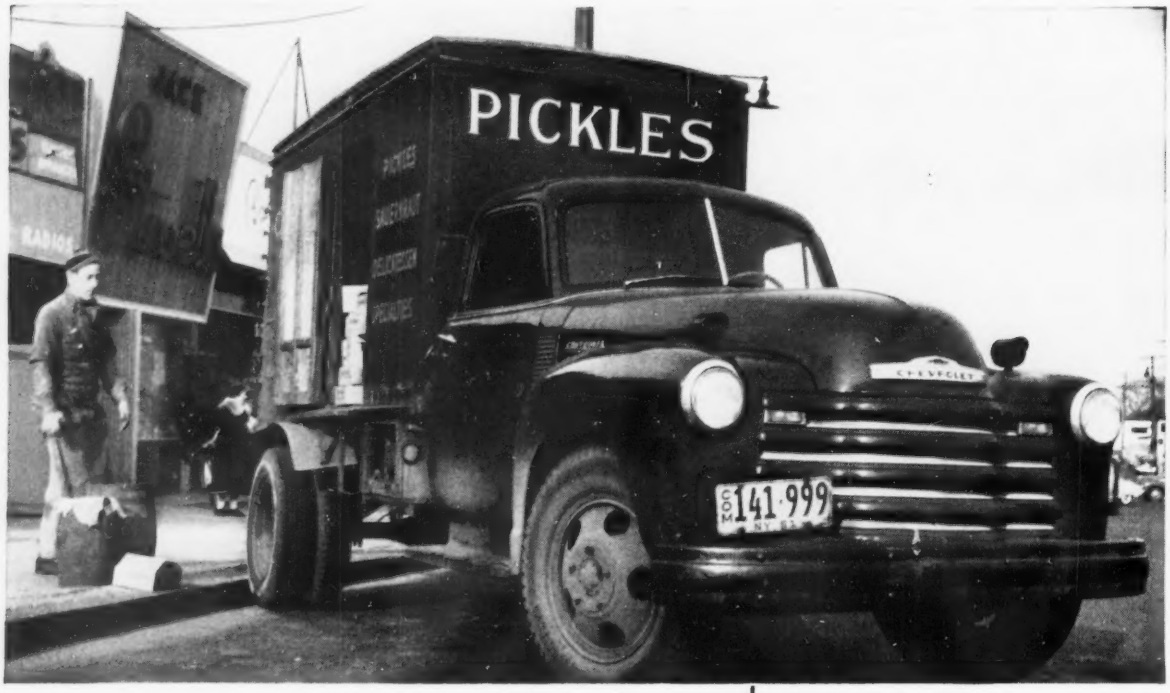
Pulling long handled valve control toward outlet permits product to flow. Reverse motion closes valve.—*Lawrence P. Money, Northville, Mich.*



Improvised Valve Corrects Spillage

Until Fine Products Co., Atlanta, Ga., installed satisfactory plant-built cutoff valves on sugar ducts at weighing stations, sugar was always spilled in that area.

Efficient cut-off valves were made as illustrated in sketch.—*FE Staff.*



4 Powerful Reasons why costs go down with CHEVROLET ADVANCE-DESIGN TRUCKS on the job

EXTRA POWER WITH ECONOMY! More hauling power, greater economy! That's the result of new 7.1 to 1 compression ratio of improved Loadmaster engine on 5000 and 6000 Series heavy-duty and forward control models—optional on 4000 Series heavy-duty trucks. Thriftmaster engine in light- and medium-duty models provides traditional Chevrolet economy.

ENGINEERED FOR THE JOB! With Chevrolet, you buy a truck that is exactly right for the job. Not too big. Not too small. You get a truck engineered from the ground up with your job in mind—with the right tires, springs, axle, clutch and engine. You get a truck that will stick on the job day after day, and do your work at lowest cost.

BUILT TO LAST! The extra-sturdy construction of Chevrolet advance-design trucks means longer life, even lower costs. Now, Chevrolet trucks are brawnier than before—with heavier, more rigid frames, with greater ruggedness and stamina built right in. These are the toughest and the sturdiest Chevrolets ever.

THE LINE LISTS FOR LESS, TOO! With all the solid superiorities that Chevrolet offers—with all their special features and advantages—this great line of haulers lists for less than any other trucks of comparable size and specifications. See your Chevrolet dealer. Chevrolet Division of General Motors, Detroit 2, Michigan.

CHEVROLET ADVANCE-DESIGN TRUCK FEATURES

TWO GREAT VALVE-IN-HEAD ENGINES—the Loadmaster or the Thriftmaster—to give you greater power per gallon, lower cost per load. **POWER-JET CARBURETOR**—for smooth, quick acceleration response. **DIAPHRAGM SPRING CLUTCH**—for easy-action engagement. **SYNCHRO-MESH TRANSMISSION**—for fast, smooth shifting. **HYPOID REAR AXLE**—for dependability and long life. **TORQUE-ACTION BRAKES**—on light-duty and medium-duty models and on front of heavy-duty models. **TWIN-ACTION REAR BRAKES**—on heavy-duty models. **DUAL-SHOE PARKING BRAKE**—for greater holding ability on heavy-duty models. **CAB SEAT**—with double deck springs for complete riding comfort. **VENTIPANES**—for improved cab ventilation. **WIDE-BASE WHEELS**—for increased tire mileage. **BALL-GEAR STEERING**—for easier handling. **UNIT-DESIGNED BODIES**—for greater load protection. **ADVANCE-DESIGN STYLING**—for increased comfort and modern appearance.

CHEVROLET first in demand in value in sales

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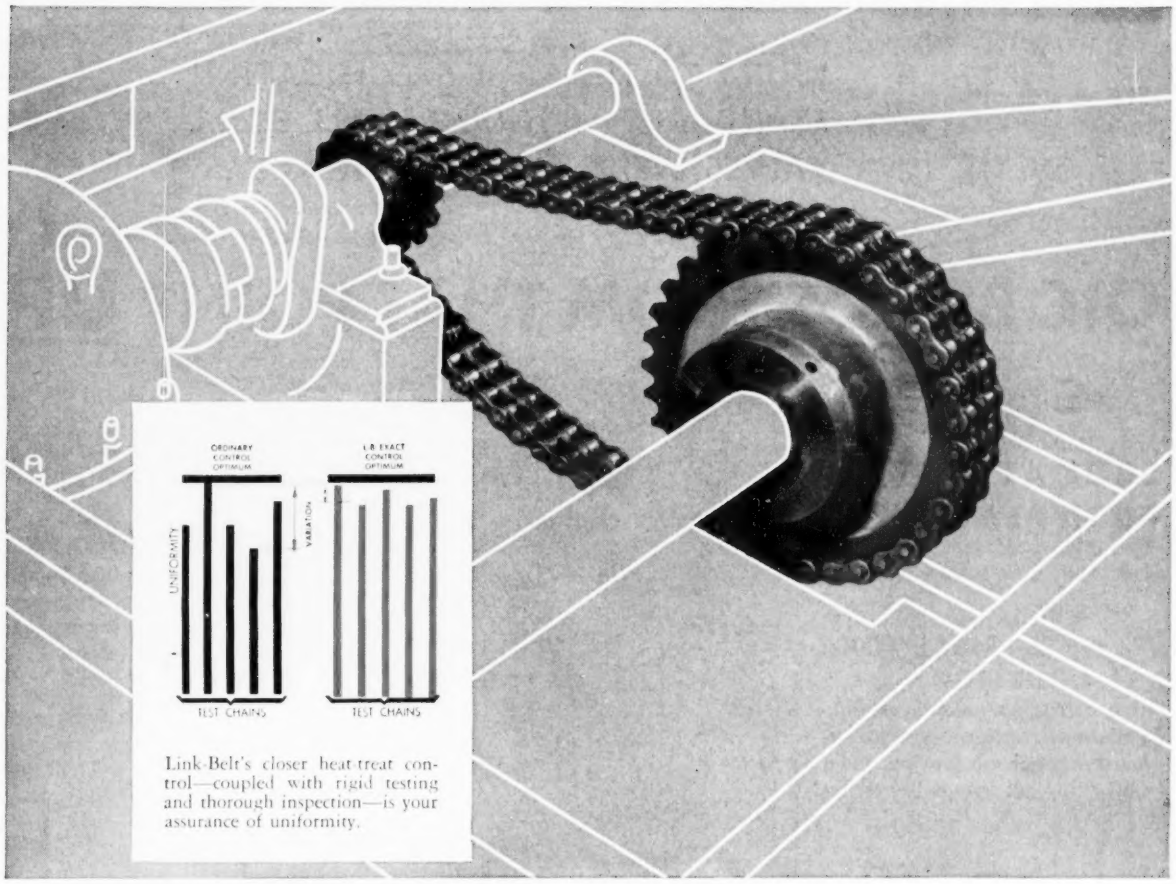


Link-Belt's closer heat-treat control—coupled with rigid testing and thorough inspection—is your assurance of uniformity.

Closer heat treat control means longer roller chain life!

But it's only one of many engineering extras you get from LINK-BELT

THE long-life record of Link-Belt Precision Steel Roller Chain is based on more than closer heat treat control. Consider such extra-wear features as shot-peened rollers and lock-type bushings. They're further assurance of Link-Belt's *built-in* extra life.

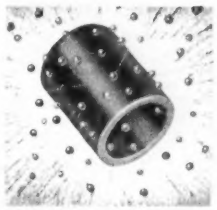
Link-Belt Roller Chain is available in single or multiple widths, ⅜" through 3" pitch. Double pitch, 1" through 3". For all the facts, call the Link-Belt office or distributor near you today, or write for Data Book No. 2457.

LINK-BELT

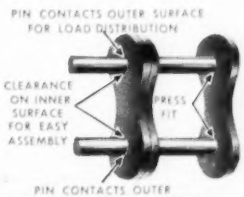
ROLLER CHAIN & SPROCKETS

LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Colmar, Pa., Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle, Toronto, Springs (South Africa), Sydney (Australia); Sales Offices, Factory Branch Stores and Distributors in Principal Cities. 13.12[A

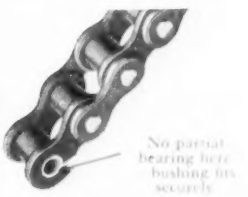
Don't overlook these other LINK-BELT extras



Shot-peened rollers have extra fatigue life for higher speeds, heavier loads.


PIN CONTACTS OUTER SURFACE FOR LOAD DISTRIBUTION
CLEARANCE ON INNER SURFACE FOR EASY ASSEMBLY
PRESS FIT
PIN CONTACTS OUTER SURFACE FOR LOAD DISTRIBUTION

Couple, uncouple multiple-width chains easily.



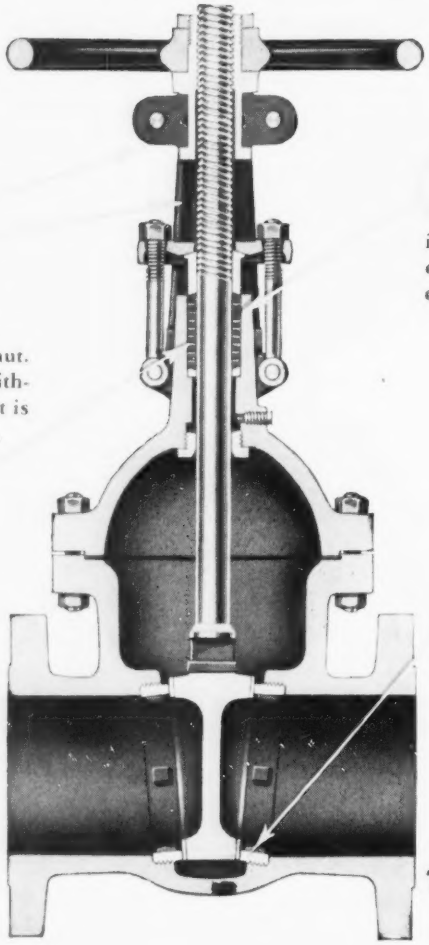
Lock-type bushings assure free articulation.

For more information, use coupon on page 201.

"BUILT TO THE SAME SPECIFICATION STANDARDS – I THOUGHT ALL STEEL VALVES WERE ALIKE AS TWO PEAS"

OIC BUILDS FROM THAT POINT UP

LOOK AT THESE FOUR FEATURES:



1 2–PIECE YOKE DESIGN

simplifies replacement of yoke nut. Permits replacement of yoke nut without shutting down the line. Yoke nut is OIC Alloy 40; non-galling material.

2 STUFFING BOXES

have greater depth than is specified, permitting the use of 7 to 9 rings of packing, with either wiper rings or condensing chamber below.

3 OIC'S SEAL–EVER PACKING

(exclusive with OIC) lasts 10 to 15 times longer than ordinary packing. It stops pitting and corrosion of stems.

4 SEAT RINGS

are end-seated and are subjected only to compression forces when valve is closed; no loosening of seat rings with repeated opening and closing of the valve. No open spaces to cause turbulence, accumulate dirt and hasten corrosion.

THE BEST STEEL VALVE YOU CAN BUY

This combination involving yoke design, stuffing boxes, packing and seat rings is evidence of OIC's desire to build *beyond* minimum specifications.

THE OHIO INJECTOR COMPANY, WADSWORTH, OHIO

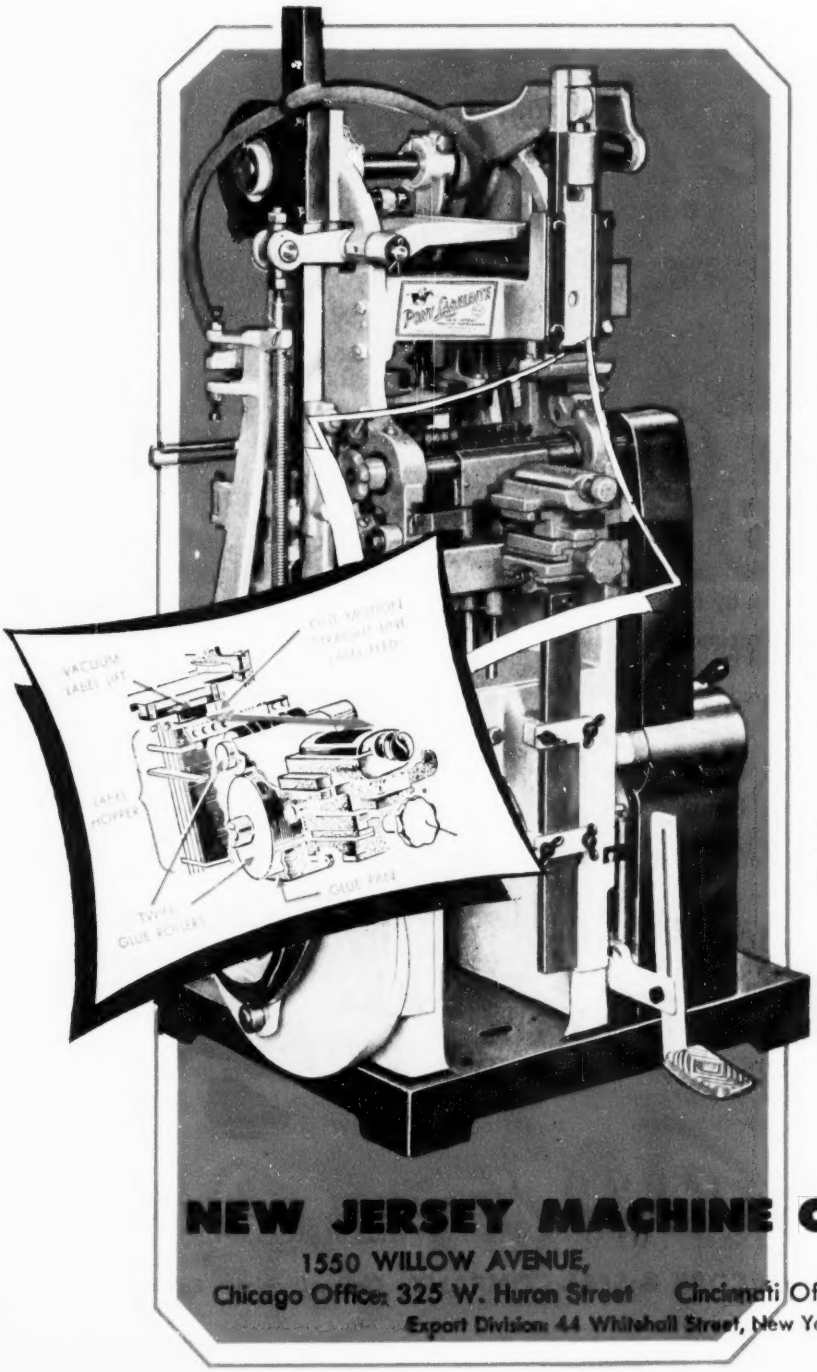
OIC FOUNDED 1883

VALVES

FORGED AND CAST STEEL · IRON · BRONZE

Labeling — on the PONY LABELRITE

gives you these 2 Outstanding Advantages:



1 "Air-tight" VACUUM label handling in one continuous stroke, *guarantees* perfect label registry.

2 Twin-roller method of glue applying, applies tissue-thin film of adhesive over full surface of label—and eliminates bottle wiping.

—

These two features alone lower the cost of labeling, and give you better looking results, because no inspection, wiping or retouching required.

★

Ask about ALL the reasons why the Pony Labelrite does better labeling, costs less to operate.

NEW JERSEY MACHINE CORPORATION

1550 WILLOW AVENUE, HOBOKEN, N. J.

Chicago Office: 325 W. Huron Street Cincinnati Office: 1701 Carew Tower

Export Division: 44 Whitehall Street, New York, N. Y.

For more information, use coupon on page 201.

So convenient to use!

Your Customers like the way Crown Vacuum Lug Caps can be removed with a simple quarter-turn by hand. They also appreciate the perfect re-seal these closures make time after time.

You Will like the dependable hermetic seal these caps provide . . . the speed at which they are applied with Crown's automatic vacuum capper. Sealing with Crown Vacuum Lug Caps is one of the most important developments in glass packaging that has come along in years. If you vacuum pack one or more of your products, you'll be wise to look into it right away. Write, wire or phone us for complete details.

The Vacuum Seal with Sales Appeal!

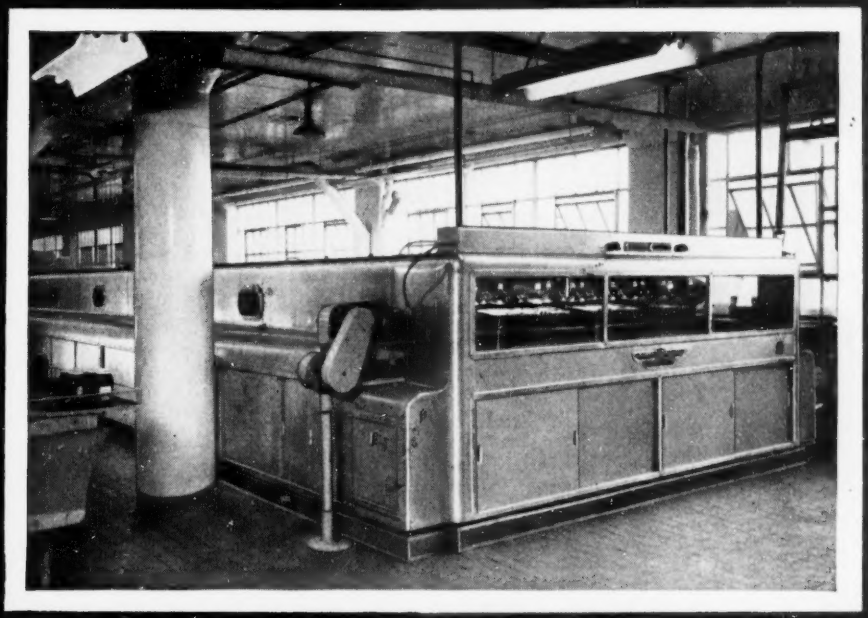
Off with a twist!

Makes a perfect re-seal!

CROWN *Vacuum Lug Caps*

CROWN CORK & SEAL COMPANY *Closure Division – Baltimore 3, Maryland*

the "VORTEX" Cools Preserves



FOR ANOTHER LEADING FOOD PRODUCER

It's Automatic, Continuous — Cuts Processing Costs!

The Kroger Co., one of many prominent food processors, uses the famous Barry-Wehmiller Vortex machine to cool preserves in its Cincinnati, Ohio plant. Because Kroger wanted to sterilize the head space between the closure and top of product, Barry-Wehmiller engineers incorporated a bank of infra-red lights in the design of the machine.

Here is another example of the adaptability of the Vortex to meet many requirements. It is successfully being used as a cooler, freezer, pasteurizer or exhaust box. Whatever its use, the Vortex will increase production and lower costs with an entirely automatic operation.

Barry-Wehmiller's knowledge of engineering and food technology added this sterilization feature to the proven advantages of the "walking beam" conveyor, atomized spray system of heat transfer and low power hydraulic drive. Write for bulletin and complete information on how the Vortex can be engineered to solve *your* problems as well as improve your processing and lower your costs.

THE SUN NEVER SETS ON B-W BOTTLE CLEANERS, PASTEURIZERS & PROCESSORS

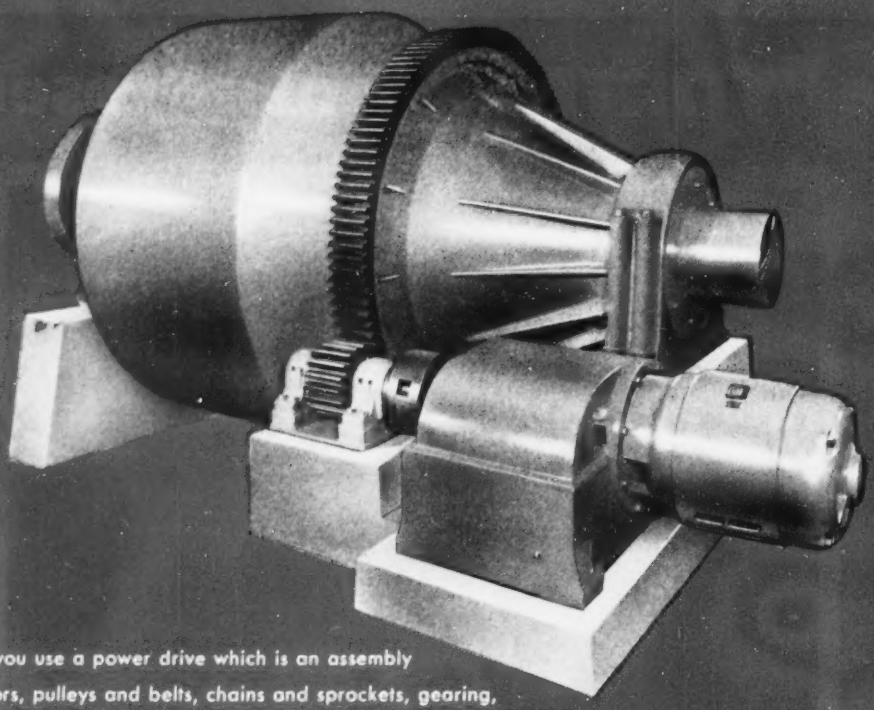
BARRY-WEHMILLER MACHINERY CO.

4660 WEST FLORISSANT AVENUE • ST. LOUIS 15, MO.

BW IN GREAT BRITAIN BARRY-WEHMILLER MACHINERY CO. LTD. QUEEN MILL LANE, QUEEN ADELAIDE ROAD, WITCHAM JUNCTION, SURREY, ENGLAND

BW-288

For more information, use coupon on page 201.



When you use a power drive which is an assembly of motors, pulleys and belts, chains and sprockets, gearing, speed reducers, etc., you waste time and money in purchasing, handling and assembling these various units into the final drive.

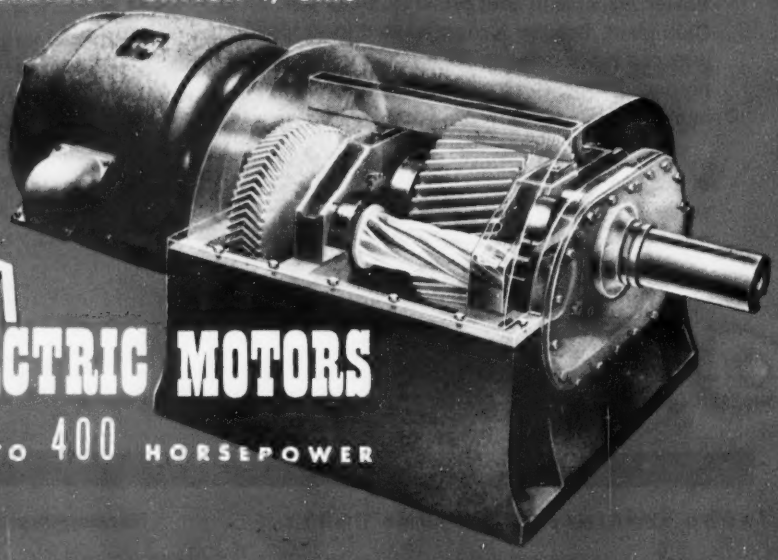
Master power drives designed as complete units with component parts matching size for size and rating for rating offer you considerable saving in space and money . . . especially in the larger sized units.

best for the BIG ones too

So don't put up with "make-shift" assemblies when you can select from Master's broad line, standard units which easily combine to give you the RIGHT horsepower, the RIGHT shaft speed, the RIGHT features in one compact unit that you can use RIGHT where you want it.

Use the RIGHT power drive to increase saleability of your motor driven products . . . improve the economy, safety, and productivity of your plant equipment. That's the horsesense way to use horsepower.

THE MASTER ELECTRIC COMPANY • DAYTON 1, OHIO



MASTER

ELECTRIC MOTORS

1/8 TO 400 HORSEPOWER

Put WASTE HEAT to WORK!

Servel changes a dead loss into valuable PROCESS COOLING *and* AIR CONDITIONING

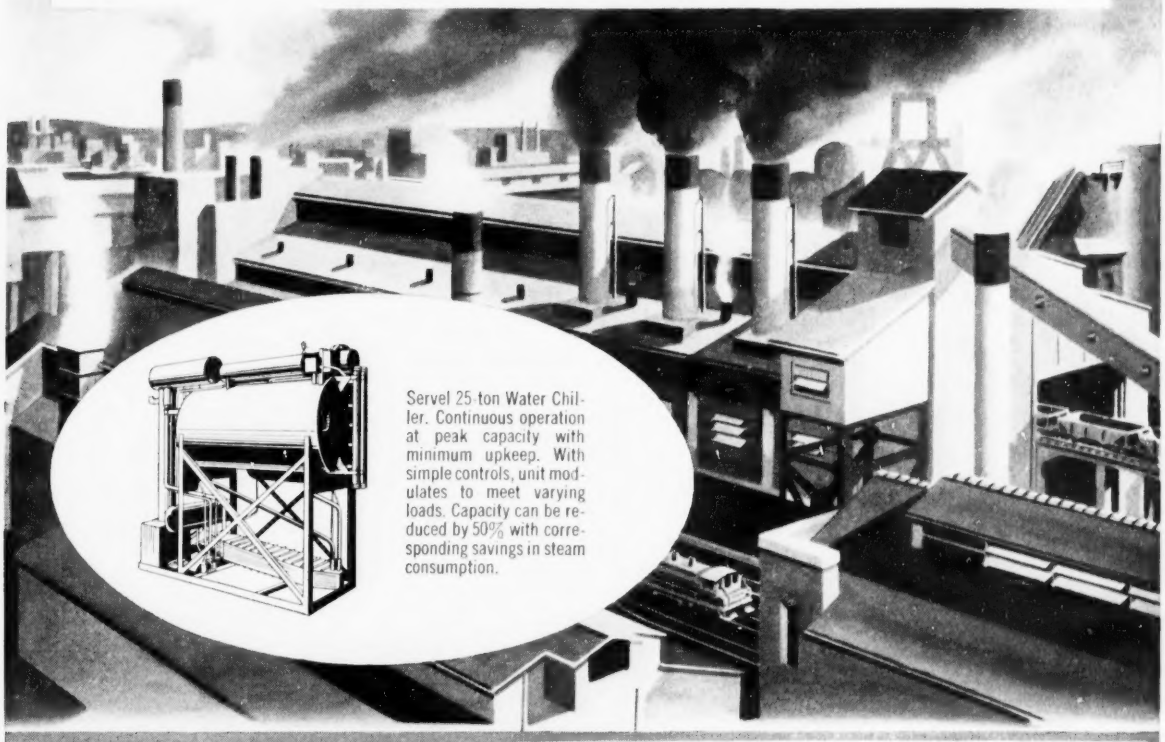
● If there's a need in your plant for air conditioning, process cooling, or industrial precooling, there's most certainly a place for a Servel Water Chiller.

These highly efficient units are powered by steam from any source. Many plants have found that *waste heat is readily turned to this use.*

Consider, too, the advantages beyond the availability and low cost of energy. Servel Water Chillers employ the time-proved absorption principle of refrigeration that *eliminates moving parts.* Water is used as the refrigerant. No compressors!

Compact size, quiet, vibration-free operation, and low floor loading make possible single or multiple installations in practically any location. Simple and economical piping arrangements are possible. In many air-conditioning installations for large buildings, duct systems can be eliminated entirely.

Servel Water Chillers are available in capacities for many types of *load. All carry a full 5-year warranty!* Contact your Servel dealer, or mail coupon for details and engineering help on your problems.



Servel 25-ton Water Chiller. Continuous operation at peak capacity with minimum upkeep. With simple controls, unit modulates to meet varying loads. Capacity can be reduced by 50% with corresponding savings in steam consumption.

Servel

the name to watch for great advances in

AIR CONDITIONING ✓ REFRIGERATION

SEND NOW FOR DETAILS!

SERVEL, INC., Dept. FE-6, Evansville 20, Indiana

Send me further details on Servel equipment for air conditioning, process cooling and industrial precooling.

Name_____

Firm_____

Address_____

City_____ Zone____ State_____

For more information, use coupon on page 201.

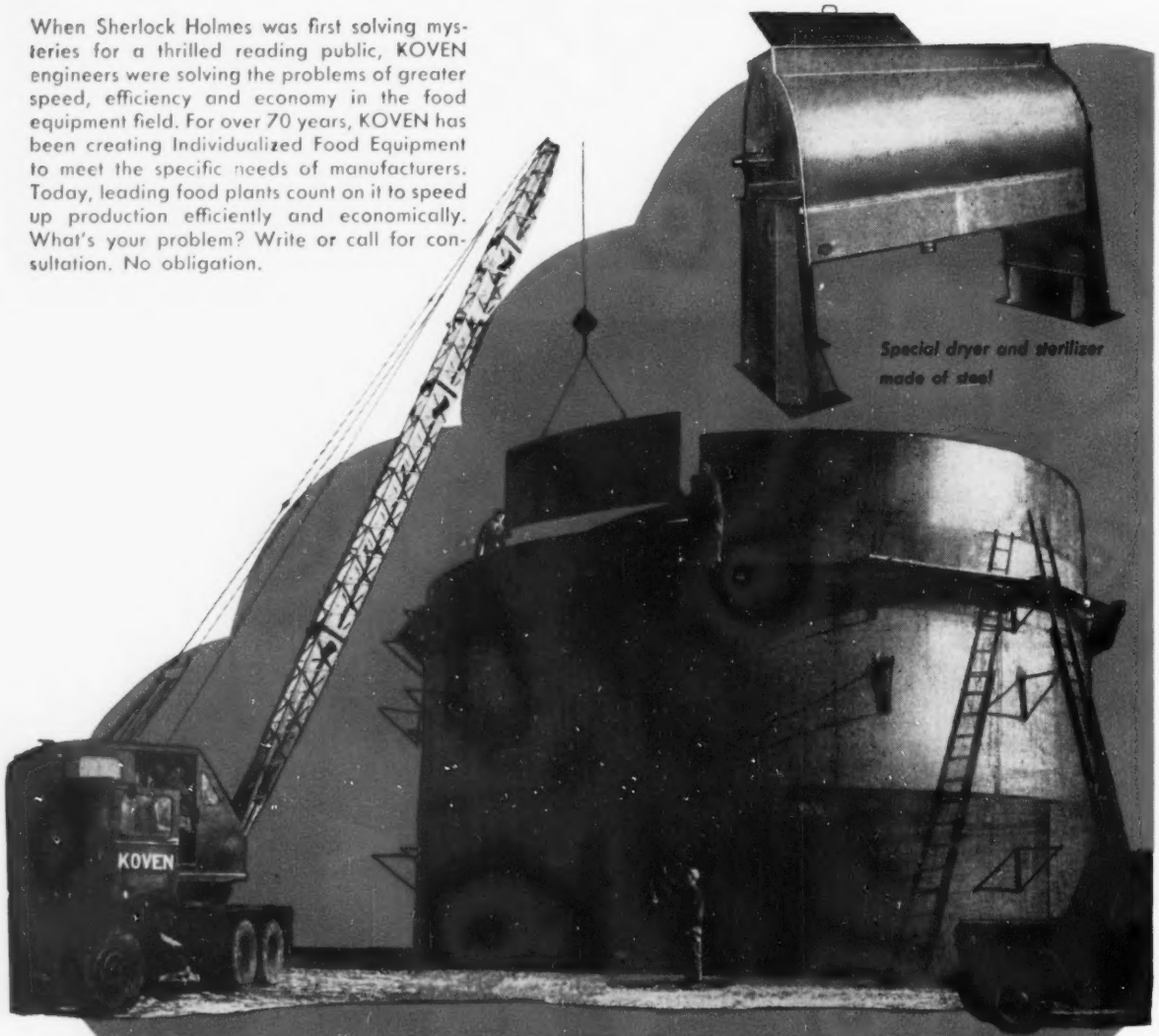
BACK IN THE 1880's

WHEN THE FAMOUS CHARACTER SHERLOCK HOLMES WAS CREATED

Koven

WAS MAKING INDIVIDUALIZED FOOD EQUIPMENT

When Sherlock Holmes was first solving mysteries for a thrilled reading public, KOVEN engineers were solving the problems of greater speed, efficiency and economy in the food equipment field. For over 70 years, KOVEN has been creating Individualized Food Equipment to meet the specific needs of manufacturers. Today, leading food plants count on it to speed up production efficiently and economically. What's your problem? Write or call for consultation. No obligation.



Special dryer and sterilizer made of steel

50' x 30' field erected storage tank

Complete modern facilities including X-ray inspection and stress relieving which insure quality control. KOVEN equipment in all commercial metals and alloys include: pressure vessels, extractors, mixers, stills, condensers, kettles, tanks, chutes, containers, stacks, coils. Fabrication to A.S.M.E. Code Par. U-68 and U-69 a specialty.

L. O. KOVEN & BRO., INC.
154-D Ogden Ave.,
Jersey City 7, N.J.

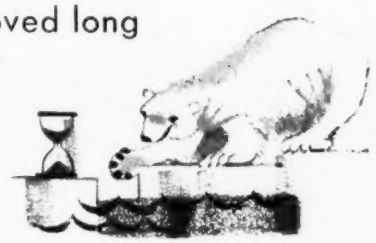
PLANTS: Jersey City, N. J.

Dover, N. J.

Trenton, N. J.

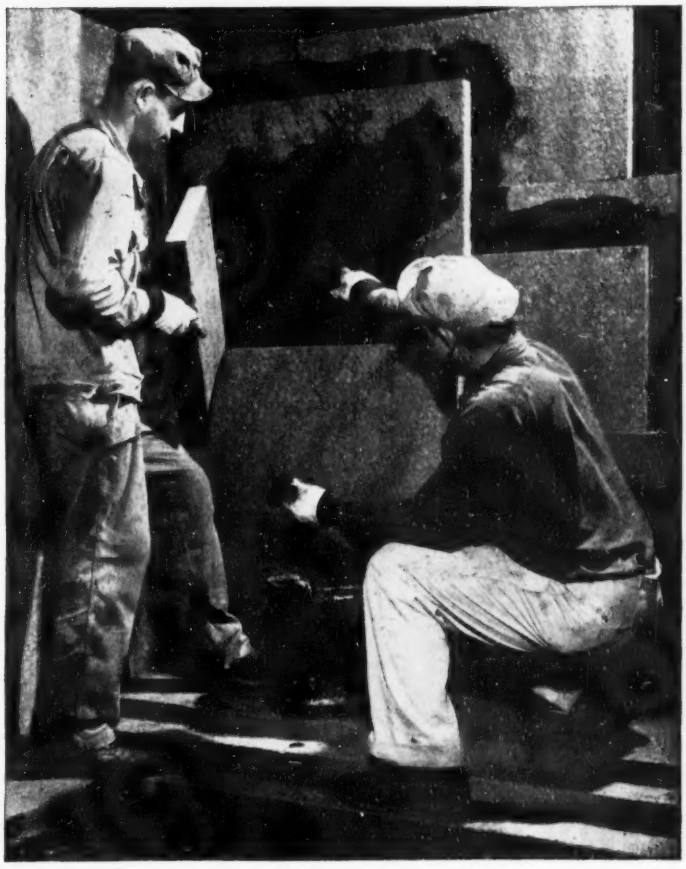
KOVEN FOR INDIVIDUALIZED EQUIPMENT SINCE 1881

Proved long life



High moisture resistance

Low thermal conductivity



For top insulation value now and in years to come . . . ROCK CORK is your best buy!

LOOKING for an *efficient* insulation . . . one that really blocks heat flow . . . one with many records of over 40 years trouble-free service?

Then Rock Cork is your insulation! When you specify Rock Cork you get the effective insulating properties of mineral wool, plus the superior moisture resistance of asphalt. What's more, Rock Cork can't deteriorate because it is basically mineral in composition . . . it will not support mold growths or microorganisms that cause decay.

Rock Cork is produced in sheets, lagging and pipe insulation, in standard sizes and thicknesses. Rock Cork Pipe Insulation has the extra protection of asphalt-saturated asbestos felt jacketing which speeds installation by reducing the need for seam filling longitudinal joints.

Skilled application always pays!

For best results, insulation should be applied by experts. Be sure of getting the most from your insulation investment by calling your Johns-Manville insulation contractor. For further information, write to Johns-Manville, Box 60, New York 16, N. Y. In Canada, write 199 Bay St., Toronto 1, Ontario.

Folder gives all the facts—

Write for your free copy of Folder IN-122A. It contains useful property tables and other important data on Rock Cork Refrigeration Insulation.

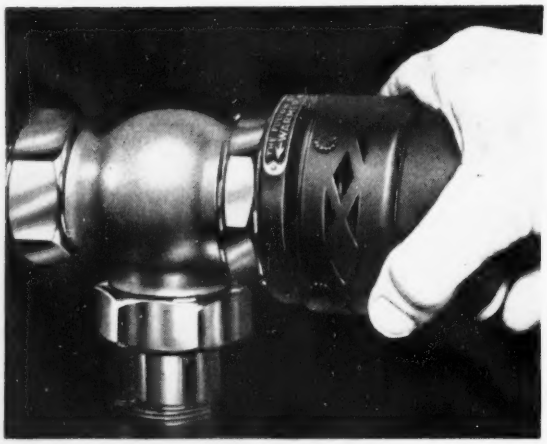
JOHNS MANVILLE JM PRODUCTS

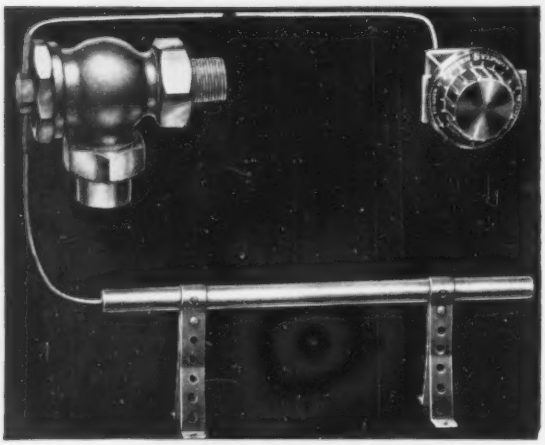
Johns-Manville ROCK CORK®

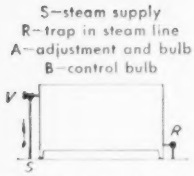
REFRIGERATION INSULATION

For more information, use coupon on page 201.

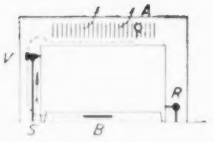
Illustrated—two basic types of Sylphon automatic radiator valves. Right, for exposed radiators. Left, for enclosed radiators. Both available in angle and globe bodies.







No. 885 on exposed radiator



No. 895 on concealed radiator

SIMPLIFIED SYSTEM *for low-cost room comfort!*

SYLPHON AUTOMATIC RADIATOR VALVES provide a simple, efficient way to get greater room comfort at lower cost—all winter long. See how effectively—how economically—they do the job.

1. These easily adjustable radiator valves assure uniform temperature control at all times—whether it's in one room, a large office or an entire building. Temperature is *kept* even. No discomfort. Result—comfort conditions and occupant efficiency are improved.

2. They substantially reduce heating costs. For studies show that during 95 per cent of the average winter season, more heat is generated than needed for healthful comfort. With Sylphon Automatic Radiator Valves controlling temperature to meet requirements, fuel is saved.

3. They cost less than any other automatic controlling system available. Easily and quickly installed on your present radiators. Simply constructed, self-powered and packless, they are self-contained and fully modulating. They pay for themselves many times over in fuel savings alone. For complete information, send for Bulletin LG-80.

FIRST WITH BELLOWS

Temperature Controls • Bellows Devices • Bellows Assemblies

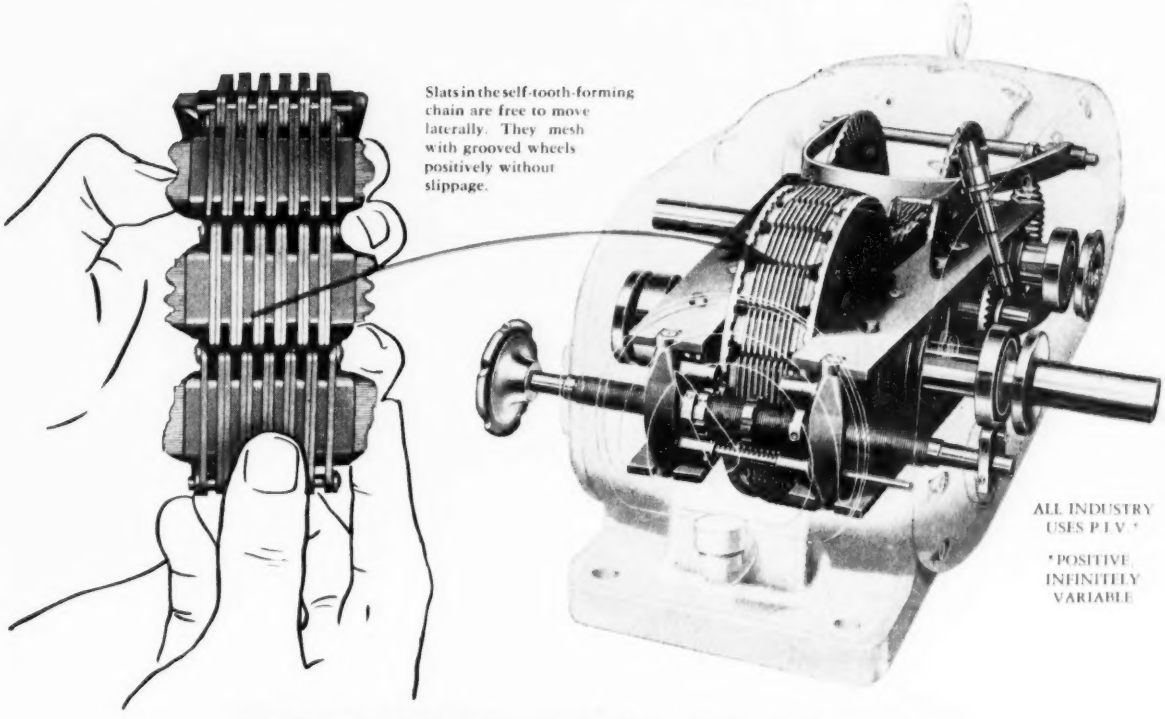
FULTON SYLPHON
DIVISION

ROBERTSHAW-FULTON CONTROLS CO., KNOXVILLE 4, TENN.

Canadian Representatives, Darling Brothers, Montreal

For more information, use coupon on page 201.

Completely POSITIVE...
Completely STEPLESS
with an infinite number of speed changes



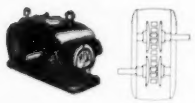
Slats in the self-tooth-forming chain are free to move laterally. They mesh with grooved wheels positively without slippage.

ALL INDUSTRY USES P.I.V.*

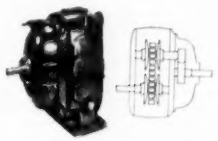
*POSITIVE INFINITELY VARIABLE

P.I.V. Variable Speed Drive gives you exact selection from maximum to minimum speed

4 of 16 P.I.V types, ½ to 25 hp. — ratios to 6:1
Horizontal or Vertical Mountings



Basic Positive, Infinitely Variable Speed Drive. Compact.



P.I.V. with single reduction input or output helical gears.

Motorized P.I.V. with single reduction input and output helical gears.

Motorized P.I.V. with single reduction input and double reduction output helical gears.

ONLY Link-Belt's P.I.V. Variable Speed Drive uses self-tooth-forming chain to provide positive, stepless speed changing. The chain meshes with grooved wheels, transmits power without wasteful slip.

What's more, Link-Belt's P.I.V. changes speeds accurately under full load, delivers full-rated horsepower to your machines. That's because P.I.V. is not dependent on friction for power transmission. Its all-metal construction is not affected by atmospheric conditions.

Adjustment is easy. You can obtain an infinite number of speeds with manual, electric, pneumatic or hydraulic controls . . . hold the exact speed you need at any setting.

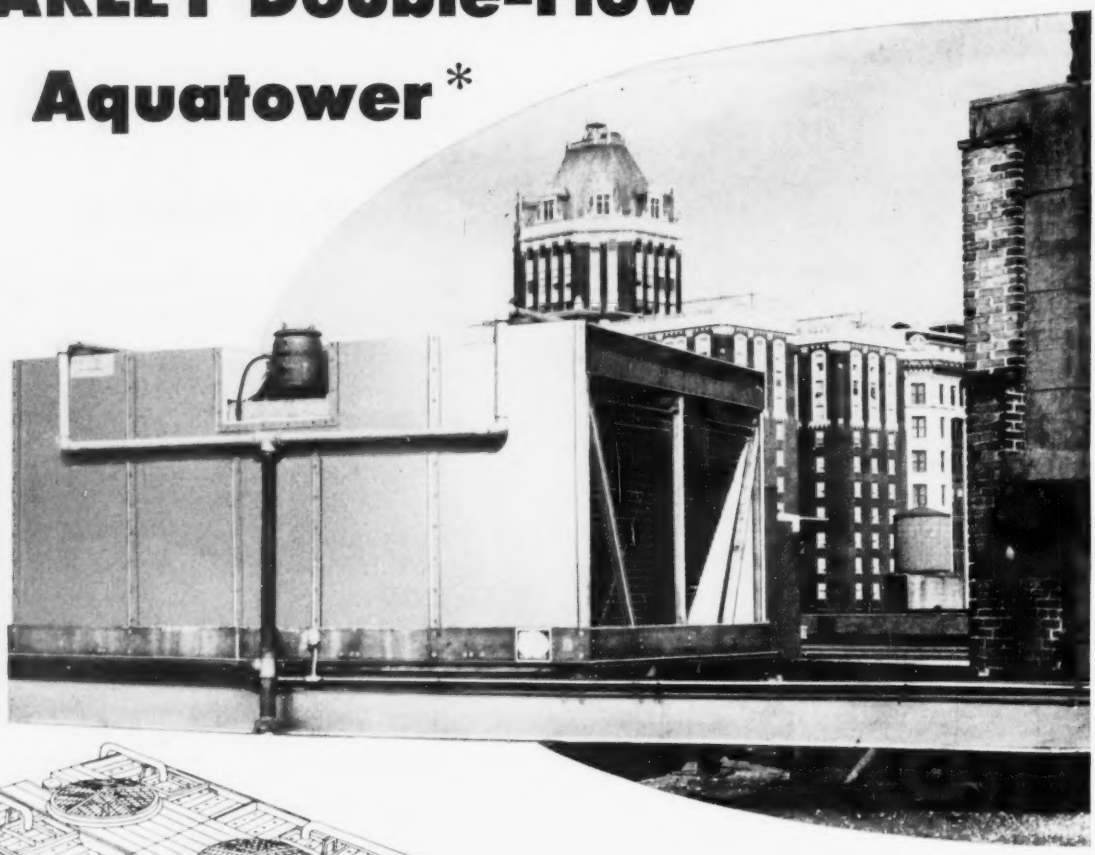
There may be a process in your plant that requires exact, variable speed transmission. If so, it will pay you to contact your nearest Link-Belt office. They'll show you how P.I.V. can increase the flexibility and efficiency of your machines. Send for Catalog No. 2274.

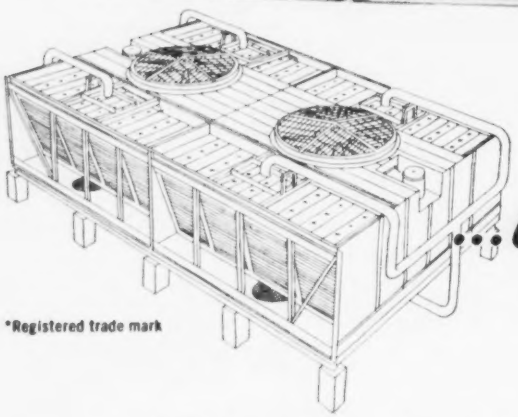
P.I.V. LINK-BELT VARIABLE SPEED DRIVE

LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Colmar, Pa., Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle, Toronto, Springs (South Africa), Sydney (Australia). Sales Offices, Factory Branch Stores and Distributors in Principal Cities. 13,116

For more information, use coupon on page 201.

MARLEY Double-Flow Aquatower*





*Registered trade mark

...a cooling method as modern as tomorrow

Old-time concepts of intermediate-capacity cooling have been completely changed since the introduction of the Marley Double-Flow Aquatower. Here, for the first time, is a unit that combines big-tower efficiency with small-tower simplicity and compactness. Big-tower features include excellent weight distribution . . . one fan that draws air from two completely open sides . . . open distribution . . . ready accessibility for inspection and maintenance. Yet, with all these advantages, the Double-Flow Aquatower reduces usual tower height by one-third, and retains all the simplicity of installation and operation found in Marley's smaller Aquatowers.

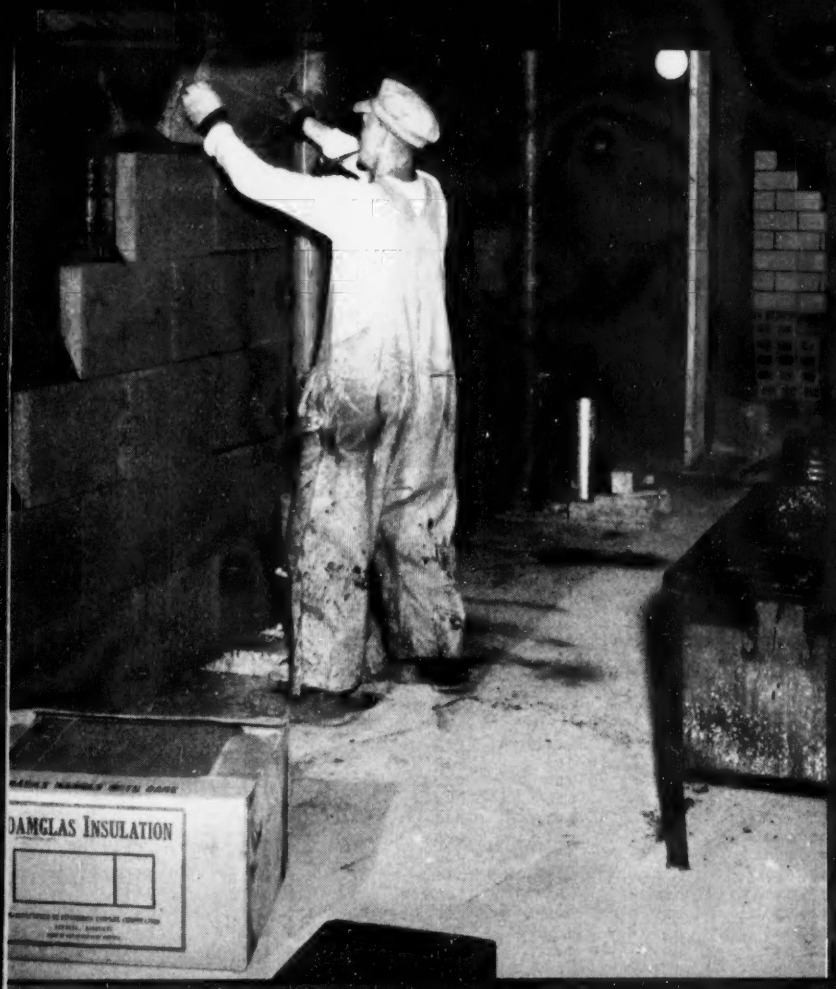
The Double-Flow Aquatower is available in a wide range of standard sizes, in all-steel or redwood with asbestos cement board casing. Lowest in silhouette and pumping head, highest in efficiency, it is Marley's answer to the demand for a modern cooling method on jobs requiring 50 tons or more of refrigeration.

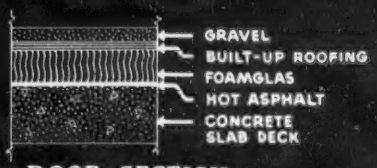
MARLEY

The Marley Company

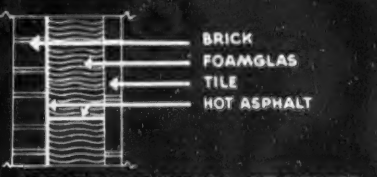
Kansas City, Missouri

For more information, use coupon on page 201.

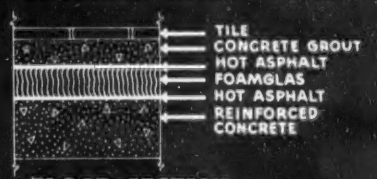




ROOF SECTION



EXTERIOR WALL SECTION



FLOOR SECTION

Architect: Louis C. Kingscott & Associates, Inc., Kalamazoo, Mich.

General Contractor: Miller Davis Co., Kalamazoo, Mich.

Roofing Contractor: C. R. Hough & Sons, Kalamazoo, Mich.

Insulation Contractor: Tony Batenburg Insulation Co., Grand Rapids, Mich.

"FOAMGLAS®

enables us to get a really dependable vapor barrier..."

. . . says C. W. Schmidt, Chief Engineer, Peter Eckrich & Sons, Inc., Fort Wayne. He explains, "We selected FOAMGLAS to insulate three coolers added to our Kalamazoo sausage and meat plant because its moisture-proof sealed glass cells enabled us to get a really dependable vapor barrier for walls, roof and floors."

Mr. Schmidt emphasizes, "We benefit particularly from FOAMGLAS' great compressive strength. When we add a second story this extra strength will permit us to construct a regular floor right on our FOAMGLAS roof. No additional support will be needed to allow this floor to bear heavy loads. A further advantage of FOAMGLAS, its vermin-proof nature, is of prime importance, of course, in the food industry."

For more facts about how FOAMGLAS can benefit *you*, send the coupon now for our new booklet on FOAMGLAS insulation in refrigerated structures.

C. W. Schmidt

PITTSBURGH PC CORNING

PITTSBURGH CORNING CORPORATION

One Gateway Center • Pittsburgh 22, Pa.

PITTSBURGH CORNING CORP., Dept. O-63
One Gateway Center, Pittsburgh 22, Pa.

Please send me your brand new booklet on the use of FOAMGLAS for refrigerated structures.

Please send me also the following:

- ☐ Free sample of FOAMGLAS
- ☐ Piping and Equipment Booklet
- ☐ Normal Temperature Buildings Booklet
- ☐ Engineer to help with specific problem
- ☐ Location of nearest source of supply

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

B&W Intermediate Alloy and Stainless CROLOY Tubing Steels

B&W offers a wide range of Intermediate CROLOY and Stainless CROLOY Tubing Steels which permit utmost discrimination in selection of composition. These grades or types have different characteristics and qualities which determine their most economical specific use. Proper selection can be made only after due consideration of all factors involved in a particular application. The metallurgists, salesmen, and technical staff of B&W will welcome the opportunity to assist in the selection of the proper grade or grades best suited to meet specific conditions of service; also, B&W Bulletins TB-1, TB-6, and TB-9, containing a wealth of data on these analyses, are yours for the asking.

ANALYSES OF THE B&W INTERMEDIATE CROLOY TUBING STEELS FOR HIGH-TEMPERATURE SERVICE

TYPE	CARBON	MANG.	SUL.	PHOS.	SILICON	CHROMIUM	MOLY.
CROLOY ½	0.10-0.20	0.30-0.60	0.05	0.04	0.10-0.30	0.50- 0.70	0.45-0.65
CROLOY 1	0.15	0.30-0.60	0.04	0.04	0.30	0.80- 1.10	0.45-0.65
CROLOY 1¼	0.15	0.30-0.60	0.03	0.03	0.50-1.00	1.00- 1.50	0.45-0.65
CROLOY 1¾	0.15	0.30-0.60	0.03	0.03	0.45-0.75	1.50- 2.00	0.60-0.80
CROLOY 2	0.15	0.30-0.60	0.03	0.03	0.50	1.75- 2.25	0.45-0.65
CROLOY 2¼	0.15	0.30-0.60	0.03	0.03	0.50	2.00- 2.50	0.90-1.10
CROLOY 3M	0.15	0.30-0.60	0.03	0.03	0.50	2.75- 3.25	0.80-1.00
CROLOY 5	0.15	0.30-0.60	0.03	0.03	0.50	4.00- 6.00	0.45-0.65
CROLOY 5-Si	0.15	0.30-0.60	0.03	0.03	1.00-2.00	4.00- 6.00	0.45-0.65
CROLOY 5-Ti*	0.12	0.30-0.60	0.03	0.03	0.50	4.00- 6.00	0.45-0.65
CROLOY 5-Cb*	0.12	0.30-0.60	0.03	0.03	0.50	4.00- 6.00	0.45-0.65
CROLOY 7	0.15	0.30-0.60	0.03	0.03	0.50-1.00	6.00- 8.00	0.45-0.65
CROLOY 8M	0.15	0.30-0.60	0.03	0.03	1.00	7.00- 9.00	0.90-1.10
CROLOY 9M†	0.15	0.30-0.60	0.03	0.03	1.00	8.00-10.00	0.90-1.10

NOTE: Percentages are maximum unless range is given.

* Titanium stabilized—Ti 4 x C min., 70% max.; Columbium stabilized—Cb 8 to 10 x C.

† Can also be furnished with 1.20-1.50% Mo, .50% Si—designation CROLOY 9.

ANALYSES OF THE B&W STAINLESS CROLOY TUBING STEELS

B&W Croloy	AISI (A) Type Number	% Carbon Max.	% Manganese Max.	% Phosphorus Max.	% Sulphur Max.	% Silicon Max.	% Chromium	% Nickel	% Molybdenum	% Other Element
Croloy 18-8 H-C	302	.08-.20	2.00	.04	.03	1.00	17.0-19.0	8.0-10.0	..	..
Croloy 18-8 Si	302B	.08	2.00	.03	.03	2.00-3.00	17.0-19.0	11.0-14.0	..	..
Croloy 18-8 F-M	303	.15	2.00	.03	.04	1.00	17.0-19.0	8.0-11.0	..	Se .07-.20
Croloy 18-8 S	304	.08	2.00	.03	.03	.75	18.0-20.0	8.0-11.0	..	..
Croloy 18-12	305	.12	2.00	.04	.03	1.00	17.0-19.0	10.0-13.0	..	..
Croloy 20-10	308	.08	2.00	.03	.03	.50	19.0-22.0	10.0-12.0	..	..
Croloy 25-12	309	.08	2.00	.025	.025	1.00	22.0-26.0	12.0-15.0	..	..
Croloy 25-12 Cb	..	.08	2.00	.025	.025	1.00	22.0-26.0	12.0-15.0	..	Cb 8XC-1.00
Croloy 25-20	310	.15	2.00	.03	.03	.75	24.0-26.0	19.0-22.0	..	(B)
Croloy 16-13-3	316	.08	2.00	.03	.03	.75	16.0-18.0	11.0-14.0	2.0-3.0	..
Croloy 16-13-3 Cb	..	.08	2.00	.03	.03	.75	16.0-18.0	11.0 Min.	2.0-3.0	Cb 9XC-1.00
Croloy 18-13-3	317	.08	2.00	.03	.03	.75	18.0-20.0	11.0-14.0	3.0-4.0	..
Croloy 18-8 Ti	321	.08	2.00	.03	.03	.75	17.0-20.0	9.0-13.0	..	Ti 5XC-.60
Croloy 18-8 Cb	347	.08	2.00	.03	.03	.75	17.0-20.0	9.0-13.0	..	Cb 10XC-1.00
Croloy 12 T	403	.15	1.00	.03	.03	.75	11.5-13.0	..	..	(C)
Croloy 12 Al	405	.08	1.00	.03	.03	.75	11.5-13.5	.50 Max.	..	Al .10-.30
Croloy 17	410	.15	1.00	.03	.03	.75	11.5-13.5	.50 Max	(D)	..
Croloy 12-2	414	.15	1.00	.04	.03	1.00	11.5-13.5	1.25-2.50	..	..
Croloy 18	430	.12	1.00	.03	.03	.75	14.0-18.0	.50 Max.	..	..
Croloy 22	443	.20	1.00	.03	.03	.75	18.0-23.0	.50 Max.	..	Cu .90-1.25
Croloy 27	446	.20	1.50	.03	.03	.75	23.0-30.0	.50 Max.	..	N_2.10-.25

A. For tube manufacturing reasons the analysis of the B&W Croloys may vary slightly from that of the AISI Type Number.

B. Can be furnished stabilized by addition of columbium.

C. Turbine Quality.

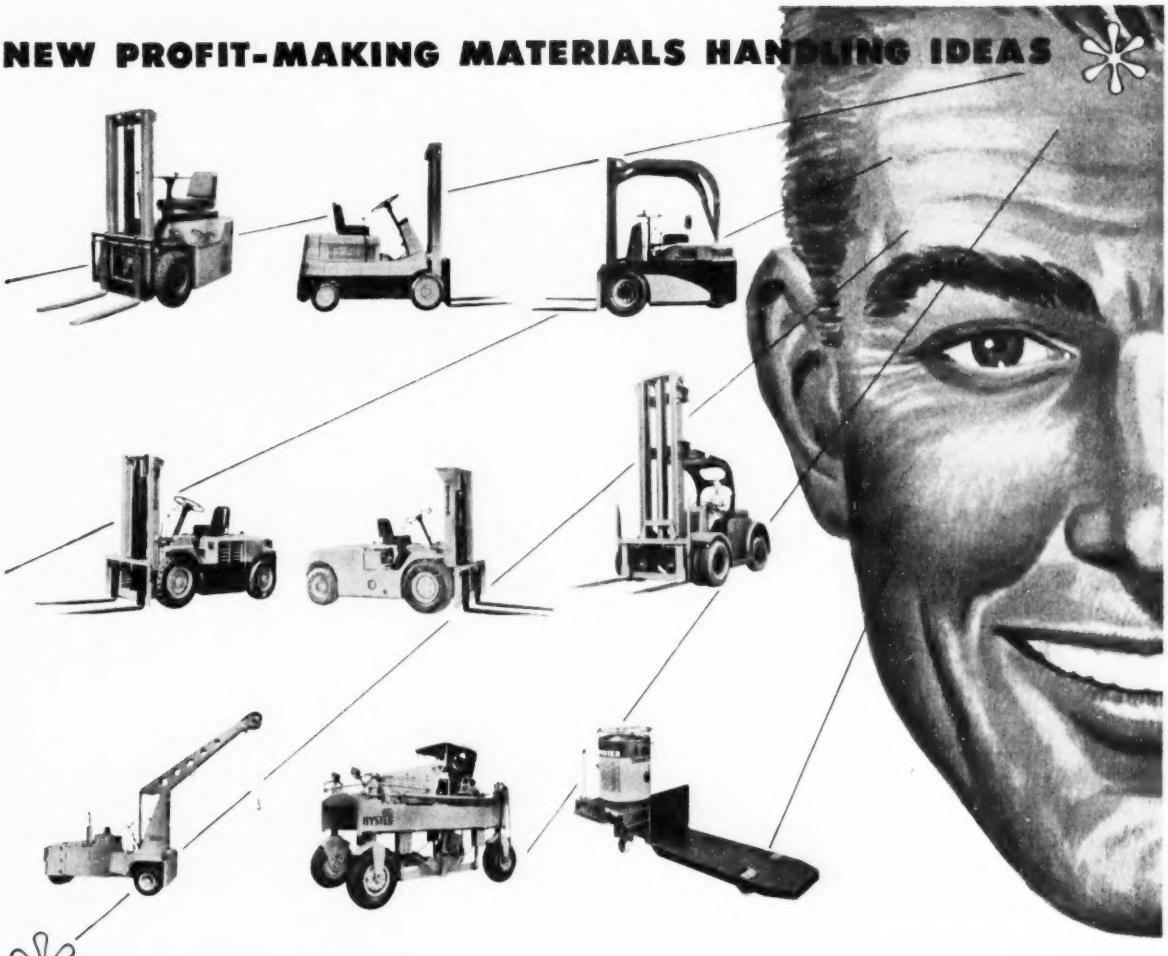
D. Can be furnished without or with addition of either ½ or 1 per cent molybdenum as an alloying element.

B&W SEAMLESS and WELDED TUBES

THE BABCOCK & WILCOX COMPANY
TUBULAR PRODUCTS DIVISION
Beaver Falls, Pa.—Seamless Tubing; Welded Stainless Steel Tubing
Alliance, Ohio—Welded Carbon Steel Tubing

TA-1762-P

NEW PROFIT-MAKING MATERIALS HANDLING IDEAS



from HYSTER one of the oldest names in materials handling

Wherever materials are moved—you'll find Hyster on the job... reducing handling costs by as much as 75%!

Progressive industry leaders everywhere depend upon Hyster Dealers for the NEW profit-building IDEAS *in their own particular industry*. Because of their everyday contact with *all* industries, Hyster Dealers are in an advantageous position to originate or pass on these ideas... ideas that so *often* have changed profit-eating into *profit-making* situations ...ideas than can help you to *spot* and *stop* profit leaks in *your* business!

Hyster — the most complete line of industrial trucks on the market — is brought to you by one of the world's most efficient dealer organizations. Over 300 Hyster Dealers all over the world will be glad to offer you the recommended materials handling practices in *your* industry — plus rentals, parts and field service. They also offer recommendations on the use of over 100 attachments which enable your Hyster Lift Truck to handle efficiently almost *any type of load* — whether it be in the form of bales, bags, bricks, bottles, bundles, boxes, or barrels! Take your first step to higher profits today by calling *your* Hyster Dealer... *or write for Catalog 1258 on Hyster Lift Trucks and Catalog 1266 on Hyster Attachments to:*

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1010-55 Myers Street ..... Danville, Illinois

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Be Sure to Call HYSTER Before You Buy ANY Lift Truck!

HYSTER

HYSTER COMPANY— Four Factories: Portland, Oregon; Danville, Illinois; Peoria, Illinois; Nijmegen, The Netherlands

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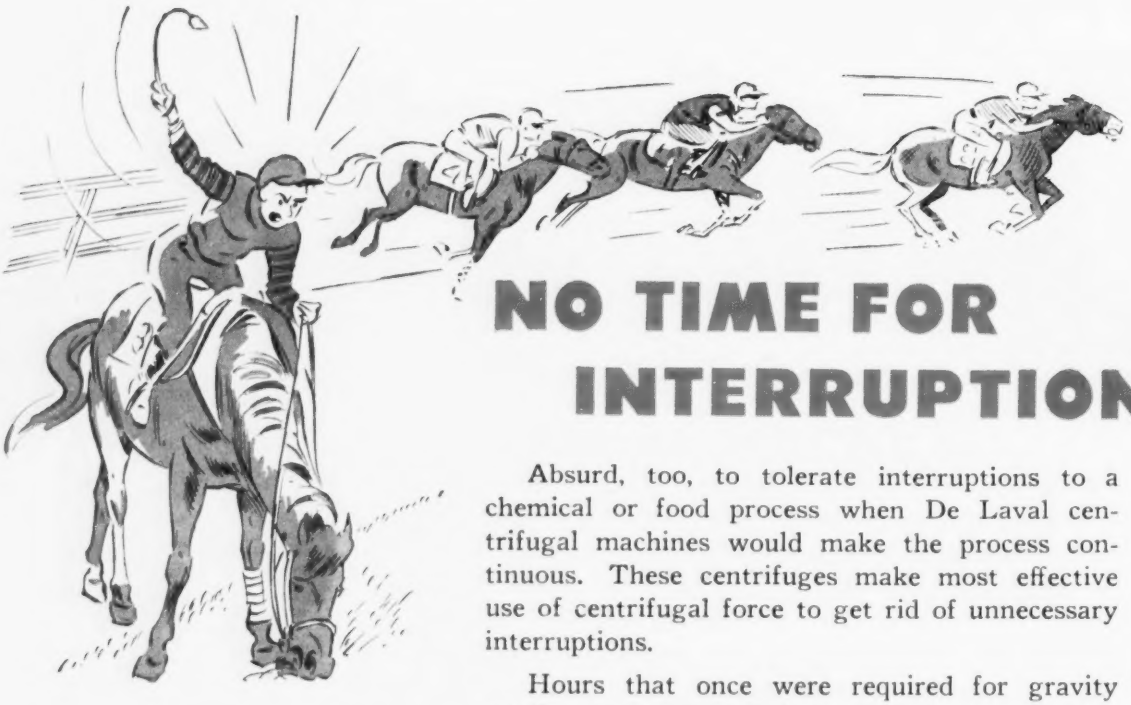


NO TIME FOR INTERRUPTION!

Absurd, too, to tolerate interruptions to a chemical or food process when De Laval centrifugal machines would make the process continuous. These centrifuges make most effective use of centrifugal force to get rid of unnecessary interruptions.

Hours that once were required for gravity settling or other inefficient methods of separation or clarification can now be cut to minutes or even seconds with De Laval centrifuges. If your process involves any of the following, it might pay you well to see whether De Laval centrifugal machines could speed it up:

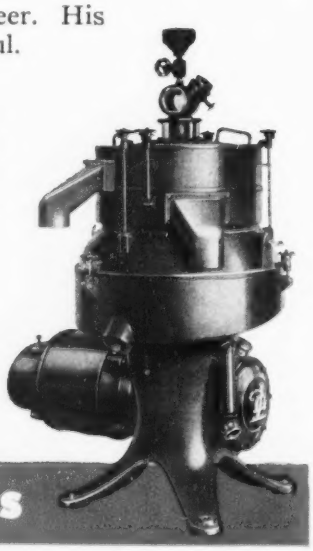
1. The continuous separation of two liquids
2. The continuous clarification of one or two liquids
3. The continuous separation of two liquids plus the continuous removal of solids from one or both.

Why De Laval?

De Laval has over 70 years' experience in solving problems of separation and clarification. Your problem may be quite similar to one that has already been solved by De Laval centrifugals. It will pay you to ask.

- Call in a De Laval engineer. His services can be very helpful.

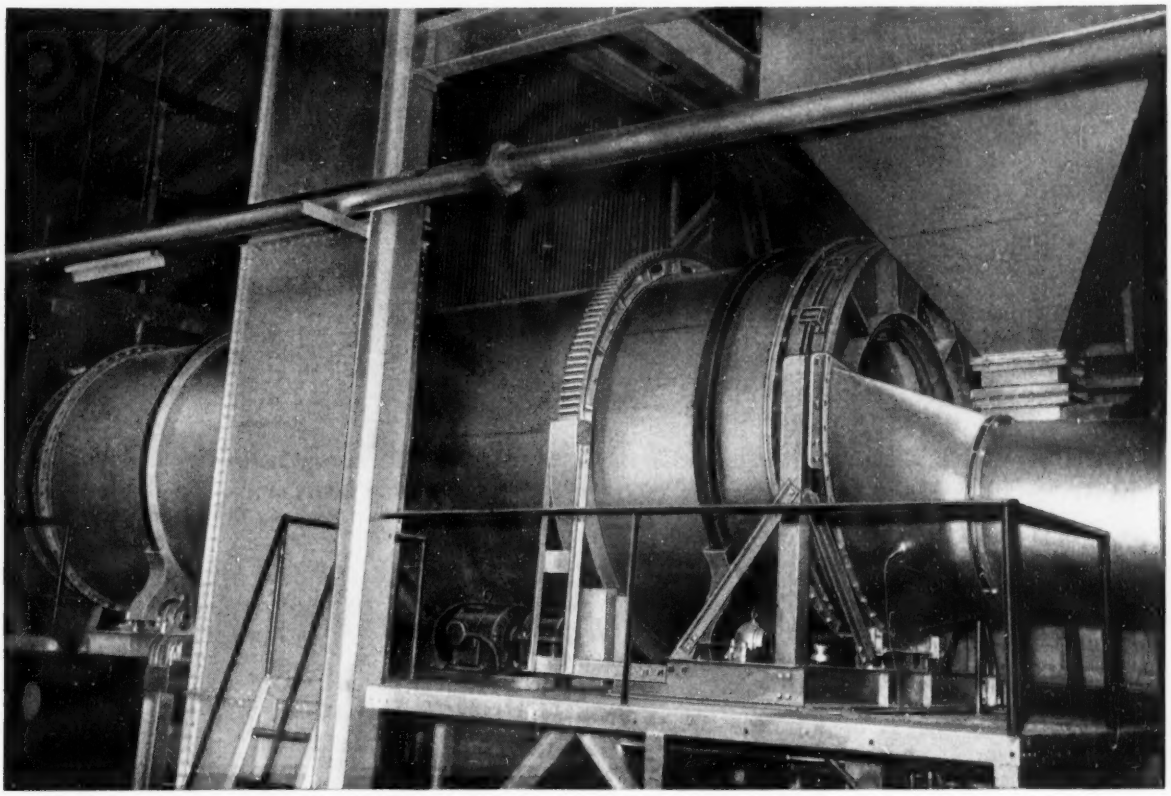
THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.



De Laval

FOR FASTER PROCESSING SYSTEMS

Get the correct dryer for your process



Roto-Louvre dryer's gentle drying principle is ideally suited for processing fragile or heat-sensitive materials.

LINK-BELT builds 3 types of dryers ... offers free testing service

WHAT's your drying problem? Heat sensitive materials? Fine particles? Materials that case-harden? These factors, plus many others, govern the selection of the correct dryer to match your production process. That's why Link-Belt builds three types of dryers—Roto-Louvre, Multi-Louvre and Monotube. And that's why we offer free analysis of your material. Simply send us a sample—a pound or a ton. Utilizing our laboratory facilities, we'll test it . . . work out procedures that can be duplicated in your plant. You'll get an unbiased recommendation for the most economical installation. Get all the facts on this no-obligation service from your Link-Belt office.

LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Colmar, Pa., Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle, Toronto, Springs (South Africa), Sydney (Australia). Sales Offices in Principal Cities.

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LINK-BELT

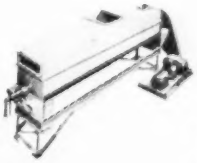
DRYERS · COOLERS · ROASTERS

ROTO-LOUVRE

Drum design provides aerated mass drying. Will not damage heat-sensitive materials. Gradual positive heat transfer prevents case-hardening. Ask for Book 1911-B.

MULTI-LOUVRE

For rapid treatment of large quantities of material. Uniform, constant agitation promotes efficient, uniform drying with minimum degradation. Ask for Book 2409.



MONOTUBE DRYER

For small, inexpensive installations. Excellent for fine-particle materials. Minimizes dusting. Equally effective at high or low temperatures. Ask for Book 2413.

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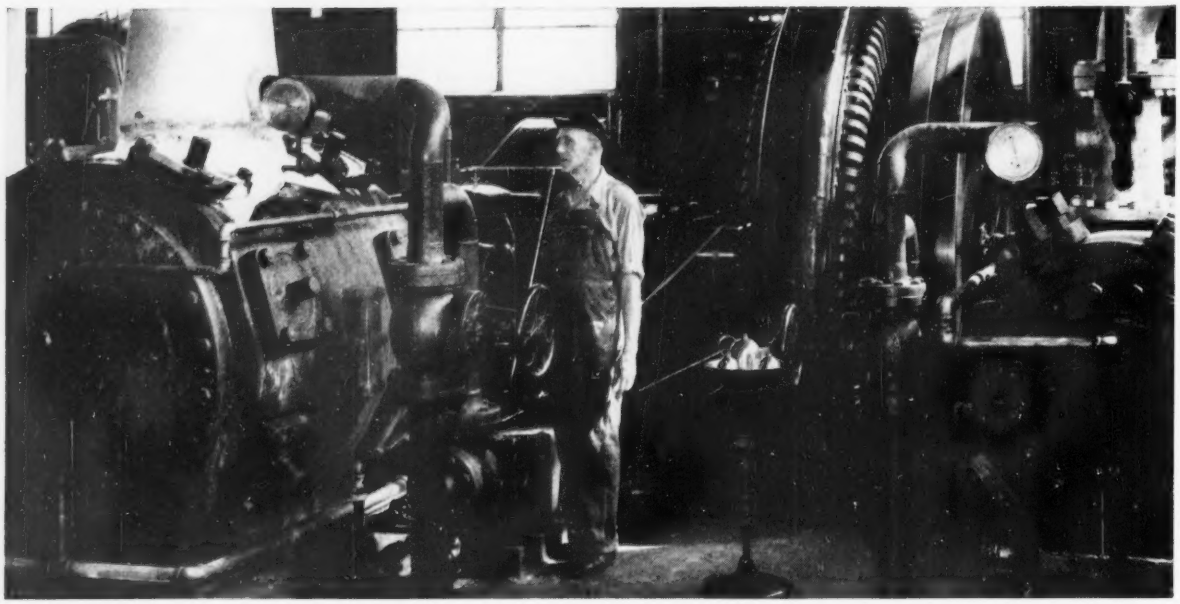
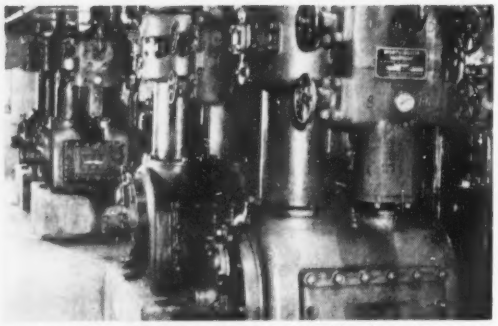
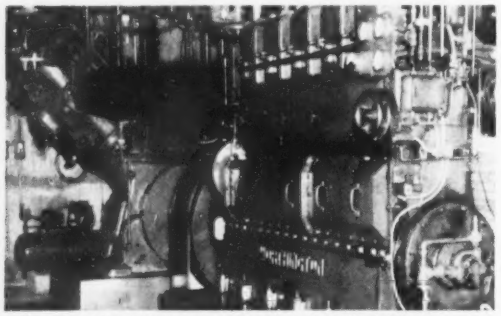


THE FIRST WORTHINGTON AMMONIA COMPRESSOR EVER BUILT, installed at Quincy Market 35 years ago.



DEPENDABLE REFRIGERATION is supplied by these four modern Worthington vertical ammonia compressors at Quincy Market's Watertown, Mass., plant.



ANOTHER WORTHINGTON AMMONIA COMPRESSOR at the Watertown plant. This one is a two-stage, "Y" type, driven by a Worthington Diesel.

Worthington ammonia compressor still in daily use after 35 years

Back in 1918, the Quincy Market Cold Storage & Warehouse Company in Boston bought its first Worthington ammonia refrigeration compressor.

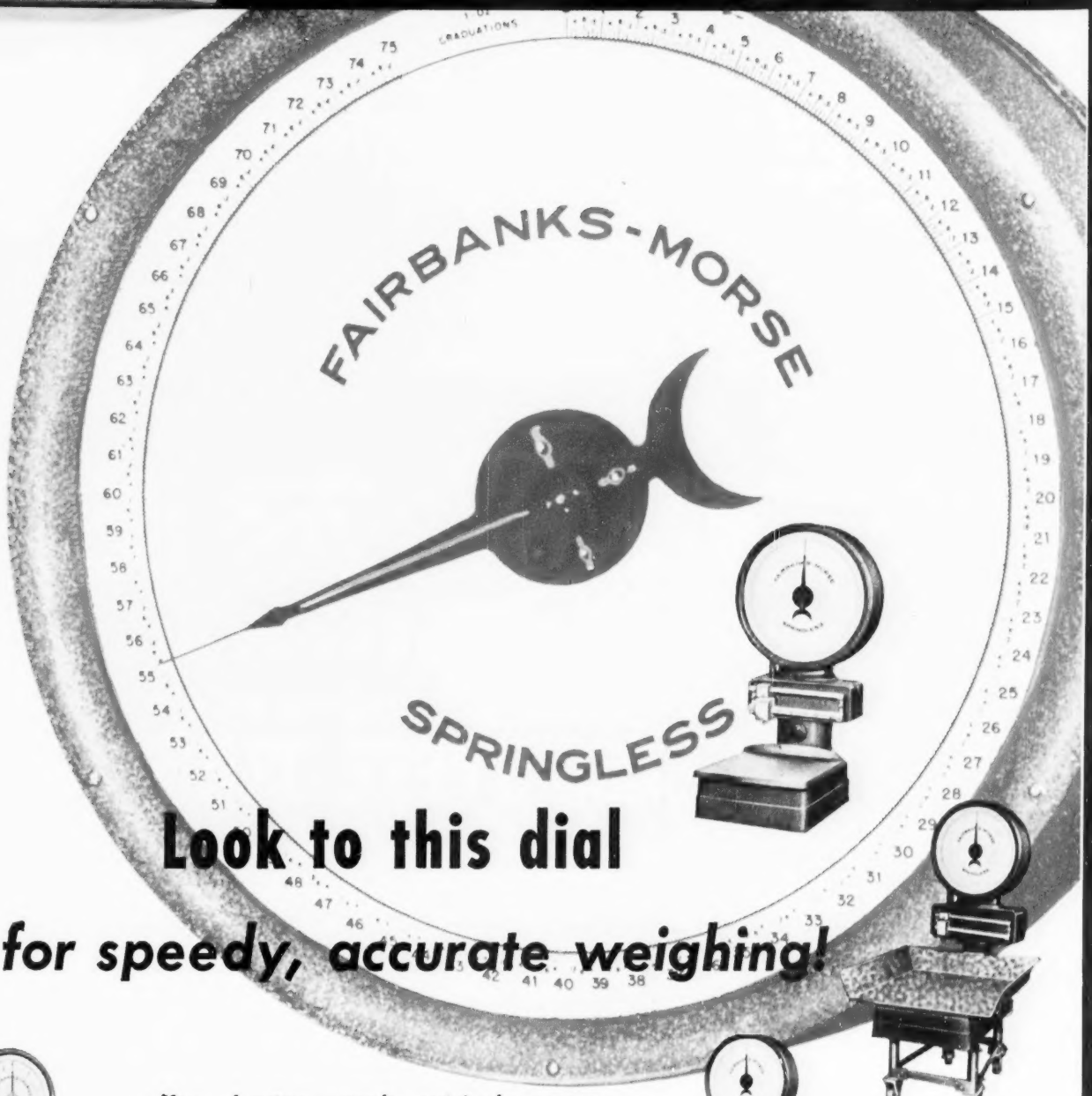
This machine, a horizontal two-stage unit running at 164 rpm, and having a capacity of about 400 tons of sub-zero refrigeration, was the starting point for drastic changes in the engineering of ammonia compressors. Eventually, the principles of design established in this initial unit were adopted by all refrigeration manufacturers.

The compressor Worthington built for Quincy Market in 1918 is still in service—after 35 years of heavy-duty operation. And today, in Quincy Market's T Wharf and Sargents Wharf power plants in Boston, their new frozen food warehouses in Watertown, Mass., Portland, Maine, and their warehouse in Troy, N. Y., many other installations of Worthington equipment are supplying dependable, efficient refrigeration. The Quincy Market has been famous for over 60 years for the quality storage of millions of pounds of frozen foods.

For over half a century, Worthington refrigeration equipment has been serving the "first names" in the food industry. So when you think of refrigeration—think of Worthington. Get in touch with your nearest Worthington district office, or write Worthington Corporation, Air Conditioning and Refrigeration Division, Section A.3.5, Harrison, N. J.

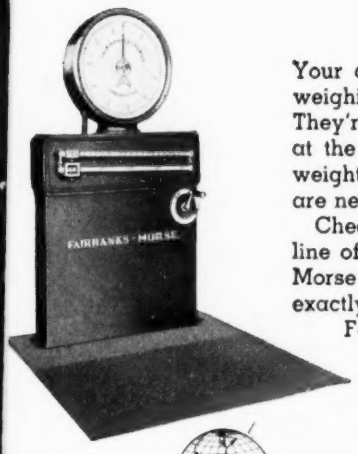
WORTHINGTON

CLIMATE ENGINEERS TO INDUSTRY, BUSINESS AND THE HOME A.3.5



Look to this dial

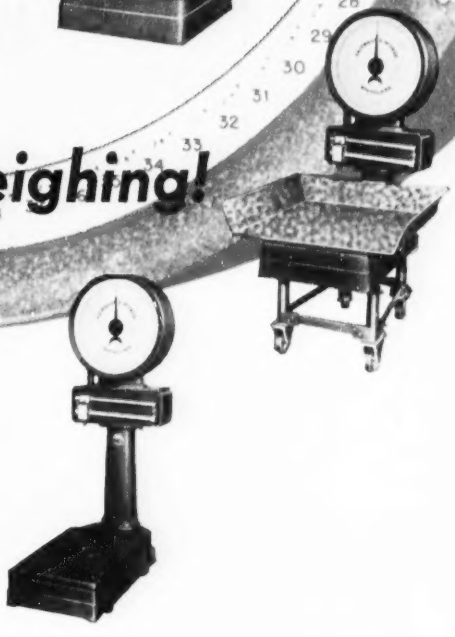
for speedy, accurate weighing!



Your advantage—speedy, sustained accuracy weighing with Fairbanks-Morse Dial Scales. They're designed for easiest reading . . . right at the point of the indicator, even with drop weights applied . . . no mental calculations are necessary.

Check the features of the Fairbanks-Morse line of Dial Scales with your local Fairbanks-Morse Weighing Expert—he'll have a scale to exactly suit your needs.

Fairbanks, Morse & Co., Chicago 5, Illinois.



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GLOBE Seamless
GLOWELD Welded

- **Resistance to Corrosion**
- **Strength at High Temperatures**
- **Resistance to Oxidation at High Temperatures**
- **Ease of Fabrication**

TYPICAL ANALYSES AND TYPES:

302	309S	316Cb	330	410
302B	309Cb	317	347	430
304	310	321	403	443
308	314	329	405	446
309	316	INCONEL * — NICHROME **		

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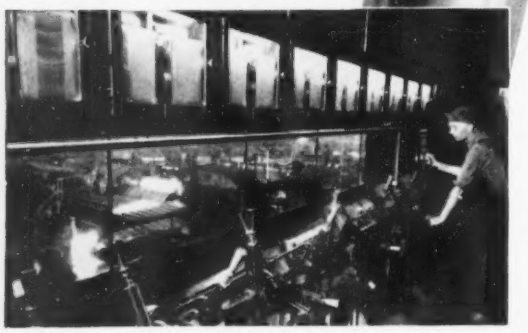
Globe produces more than 26 standard analyses of stainless steel tubes — also special analyses when required. Because varying analyses have widely varying service characteristics, Globe will make recommendations only after careful study of your particular problem.

GLOBE specialization...

meets your exact requirements in STAINLESS STEEL TUBES

Write for Bulletin 333 — Corrosion and Heat Resisting Steel Analyses Chart — a valuable reference tabulation of stainless steel analyses as produced by various manufacturers.



Piercing, rolling and reduction of seamless tubes is closely monitored from this control room — typical of the highly specialized equipment in the Globe mill.

SIZE RANGE:

Globe seamless stainless steel tubing may be had in sizes from ½ inch to 6 inches O.D., and in pipe sizes ⅛ inch to 6 inches, standard, extra strong and double extra strong weights.

Gloweld electric welded stainless steel tubing is available in sizes ranging from ¼ inch to 5 inches O.D. inclusive; in standard weight pipe (schedule 40) sizes ⅛ inch to 2 inches — lightweight pipe (schedule 5 and 10) ⅛ inch to 4½ inches inclusive.

TOLERANCE RANGE:

All stainless tubing furnished to standard A.S.T.M. specifications unless otherwise specified to suit your particular application requirements.

Globe specialization gives you uniform high quality...

Precision checks — and re-checks — at every stage of production insure Globe stainless steel tubes that meet *your* exacting specifications. For more than thirty years, specialization in production of steel tubes has key-noted all Globe research, engineering and mill operations. Write for the Globe Stainless Steel Tubes catalog.

GLOBE STEEL TUBES CO., Milwaukee 46, Wis.
Chicago — Cleveland — Detroit — New York — Philadelphia — St. Louis — Denver — Houston — San Francisco — Glendale, Cal.

Producers of Globe seamless stainless steel tubes — Gloweld welded stainless steel tubes — alloy — carbon seamless steel tubes — Globeiron (high purity ingot-iron) seamless tubes — Globe welding fittings.

close to the pin...

...shortest way to winning GOLF

Long putts go down now and then for unexpected birdies. But to collect consistently, a golfer must aim to get his approach shots close to the pin for *easy* putts. They're the ones that pay off, game after game!

close to your problems

...the BALL way to Dependable CONTAINER SERVICE

Our aim is to supply you with Glass Containers and Metal Screw Caps that meet the most exacting requirements as to specifications, quality, prompt deliveries. Ball technicians offer closest cooperation on your problems. Convenient Ball Glass and Closure plants are ready to serve any need, large or small. For "easy putts" on your packaging lines, call BALL!

CALL BALL FOR: Stock or Special Mold Glass Containers in all popular styles and sizes . . . Plain or Lithographed Metal Screw Caps, 24 to 120 mm. . . Engineering assistance on ANY container, closure or packaging problem.

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OFFICES IN ALL PRINCIPAL CITIES
Closure Division: The Aridor Company, 3428 West 48th Place, Chicago 32, Illinois
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For Containers and Closures of Quality
. . . It's Just a Short Haul From

Ball

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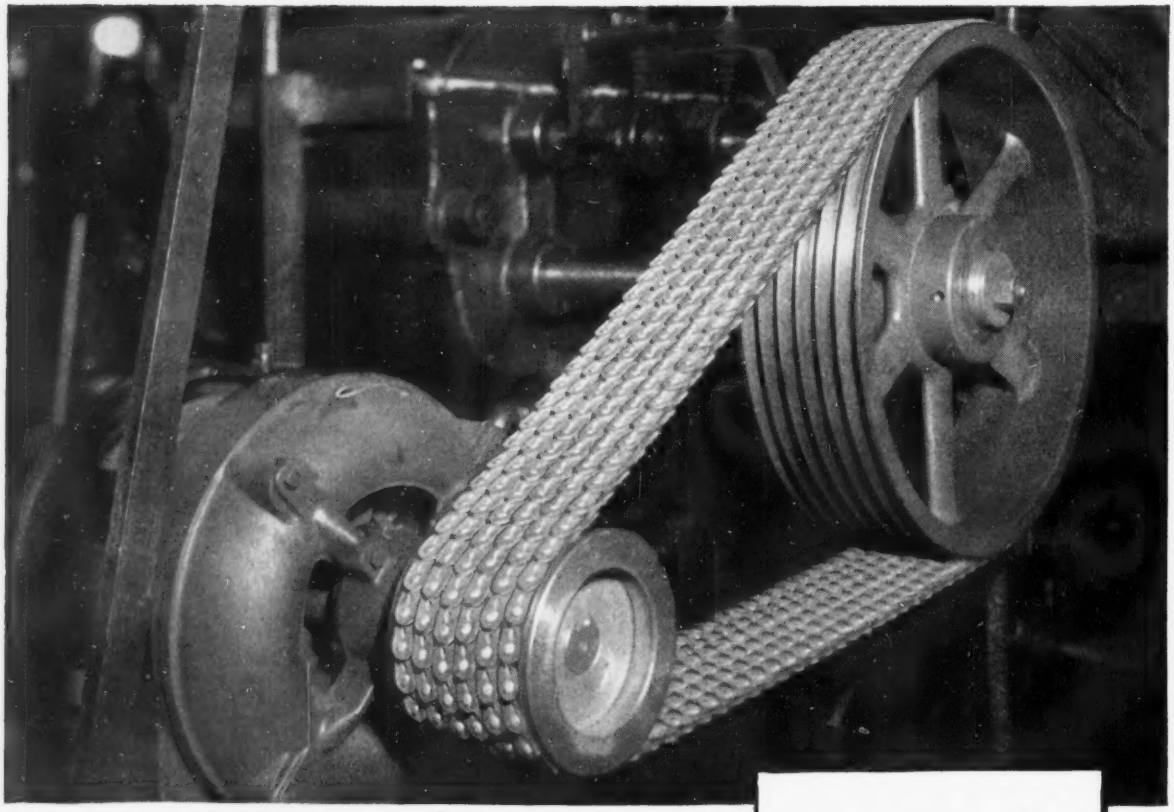


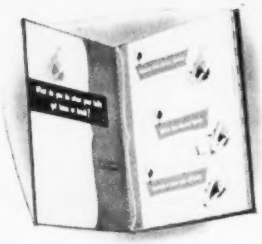
with Veelos on your machines...

v-belt adjustment is a production-saving job

All v-belts stretch—but with endless v-belts there's nothing you can do to take up this stretch once the motor has been completely "run-out". With Veelos it's another story! The adjustment is in the belt itself—even sliding motor bases are unnecessary.

Changing the length of each Veelos v-belt by just adding or removing links is the best, most efficient, way to keep the belts correctly matched. Using Veelos means that the job of adjustment is done easily and quickly . . . at a fraction of the cost of replacing with new belts.

Veelos, the adjustable v-belt, provides vibrationless, full power delivery. It is easier to stock and control because it is packaged on 100-foot reels in every standard width. And Veelos can be adjusted or made up in correctly matched sets with the least amount of machine down-time—at production-saving speed!



Have you seen this Veelos Facts Book?

Your Veelos v-belt distributor's salesman will be glad to give you a quick trip through this fact-packed, 36 page book. You'll find it well worth the few minutes it takes. Next time the salesman calls, ask him to show it to you.

VEELOS
THE LINK
V-BELT

Write today for your copy of the Veelos Data Book—it is a completely illustrated, 28-page catalog that gives file-worthy product and engineering facts which you should have handy. We'll be glad to send you a copy at once.

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ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE

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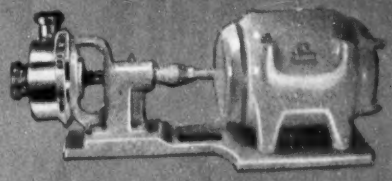
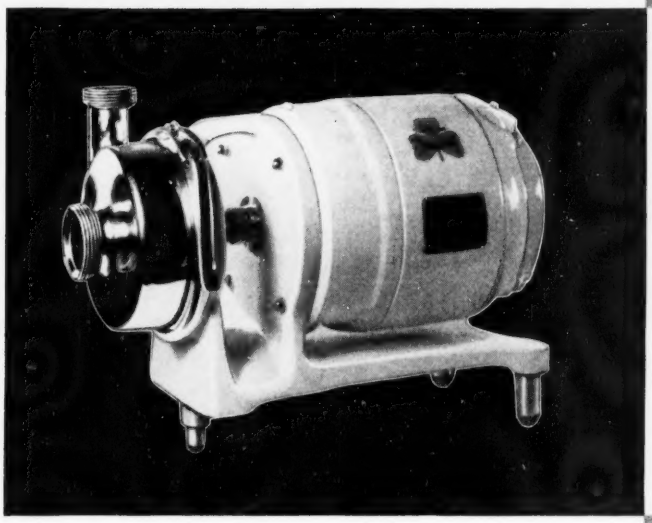
You'll find all the features you want in TRI-CLOVER PUMPS



"Standard" Sanitary Series

Designed for the non-agitating, efficient pumping of milk, food products such as diced carrots, cream style corn, tomatoes, applesauce, relish and beverages. It is also practical in breweries and for the pumping of drugs and chemicals in solution.



"Pump King" Unimount Series

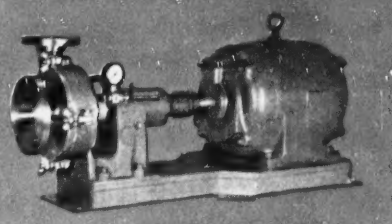
Designed for very efficient operation at 1800 and 3600 RPM, and especially where high speeds are required, through heaters, coolers, filters, clarifiers, etc. The 3600 RPM model is especially applicable in the dairy industry where high head and low capacity are essential and for handling low and medium viscosity liquids in the food processing industry.

OVER 30 years of continuous improvement is embodied in today's line of Tri-Clover centrifugal pumps.

The "Pump King" Sanitary Series—the Standard Sanitary Series—and the Industrial Series—all have exclusive Tri-Clover pump features that mean better, more efficient liquid transmission.

Patented screw type impeller with sanitary impeller clip—inert carbon seal that is easily removed and cleaned—streamlined, lightweight head with a minimum number of parts—simple, fast pump assembly and disassembly with the new Ring Clamp construction—these are just a few features that make Tri-Clover Centrifugal Pumps ideally suited for food, chemical, dairy, and industrial requirements for sanitary and corrosion-resistant service.

Benefit from these important advantages when looking for a solution to your pumping problems.



"Industrial" Series

Designed for pumping Latex, water, brine, light oils, chemicals, paints, brewery products, and liquids in the food processing field where lines are of I.P.S. type. This model offers quick disassembly features for ease in cleaning.

See your nearest Tri-Clover distributor, or write for a copy of Pump Catalog 250.

P-153

Tri-Clover
MACHINE CO.
Kenosha, Wisconsin

TRIALLOY AND STAINLESS STEEL SANITARY FITTINGS, VALVES, PUMPS, TUBING, SPECIALTIES

TRI-CLOVER

FABRICATED STAINLESS STEEL INDUSTRIAL FITTINGS AND INDUSTRIAL PUMPS

THE Complete LINE

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LIQUID, BULK or PACKAGED PRODUCTS

Move Faster In FRUEHAUFS

THE AMERICAN SUGAR REFINING COMPANY of New York uses a variety of Fruehaufs in the manufacture and distribution of Domino Sugar — Tank-Trailers to haul *liquid* sugar, Dump units to handle dry *bulk* sugar and Semi Vans to make distribution of the *packaged* product. American Sugar, like thousands of other food processors, distributors and retailers, has found that the fastest, safest and surest way to haul food products is by Fruehauf.

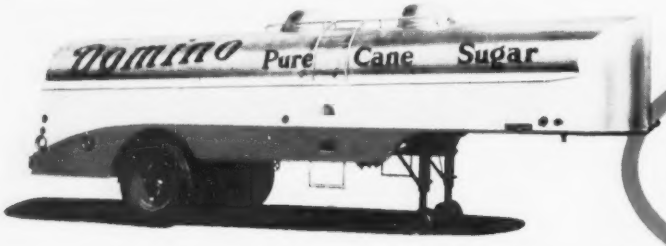
Fruehaufs have profitably solved hauling problems for shippers in all segments of the food industry. Commodities as widely varied as beans and butter-milk are handled daily in Fruehauf Trailers. The wide range of Fruehauf models, capacities and abilities means there is a Fruehauf designed to do your hauling job — economically, dependably and efficiently.

Call your nearby Fruehauf Branch for a free "Transportation Cost Analysis" that will prove there's a Fruehauf fitted to your operation.

World's Largest Builder of Truck-Trailers

FRUEHAUF TRAILER COMPANY

Detroit 32, Michigan



FRUEHAUF
TRAILERS
"ENGINEERED TRANSPORTATION"

Factory Branches in 80 Principal Cities

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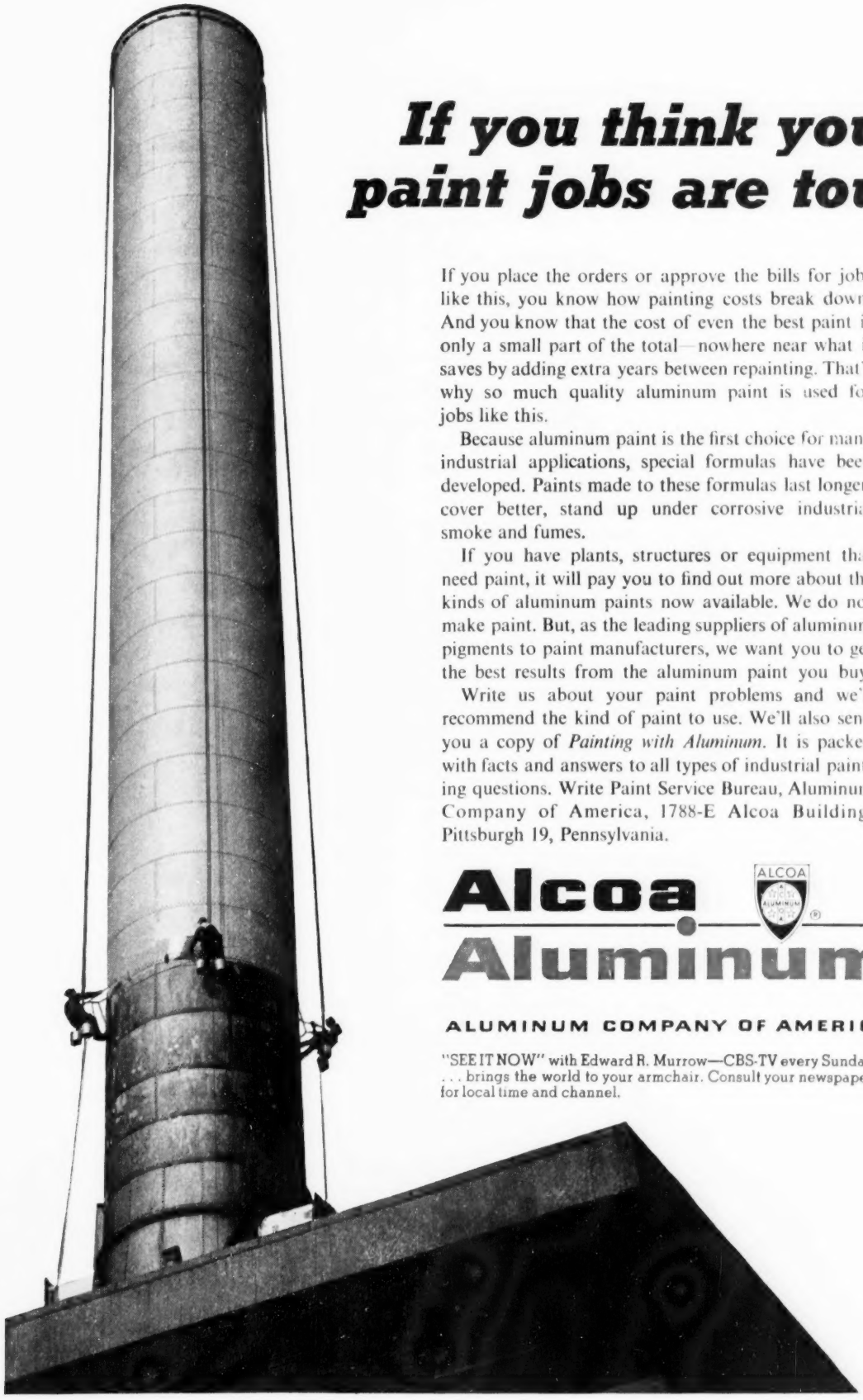

If you think your paint jobs are tough

If you place the orders or approve the bills for jobs like this, you know how painting costs break down. And you know that the cost of even the best paint is only a small part of the total—nowhere near what it saves by adding extra years between repainting. That's why so much quality aluminum paint is used for jobs like this.

Because aluminum paint is the first choice for many industrial applications, special formulas have been developed. Paints made to these formulas last longer, cover better, stand up under corrosive industrial smoke and fumes.

If you have plants, structures or equipment that need paint, it will pay you to find out more about the kinds of aluminum paints now available. We do not make paint. But, as the leading suppliers of aluminum pigments to paint manufacturers, we want you to get the best results from the aluminum paint you buy.

Write us about your paint problems and we'll recommend the kind of paint to use. We'll also send you a copy of *Painting with Aluminum*. It is packed with facts and answers to all types of industrial painting questions. Write Paint Service Bureau, Aluminum Company of America, 1788-E Alcoa Building, Pittsburgh 19, Pennsylvania.

Alcoa Aluminum

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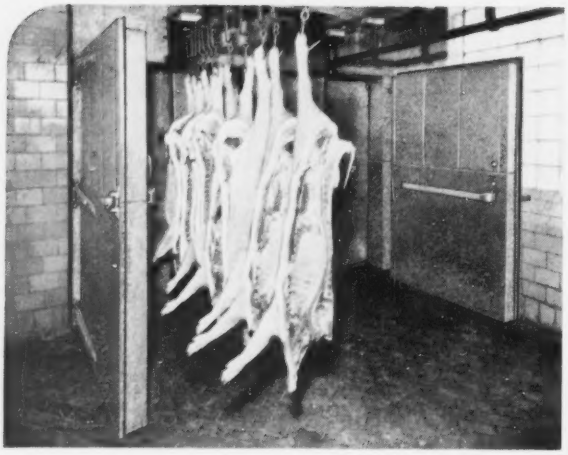
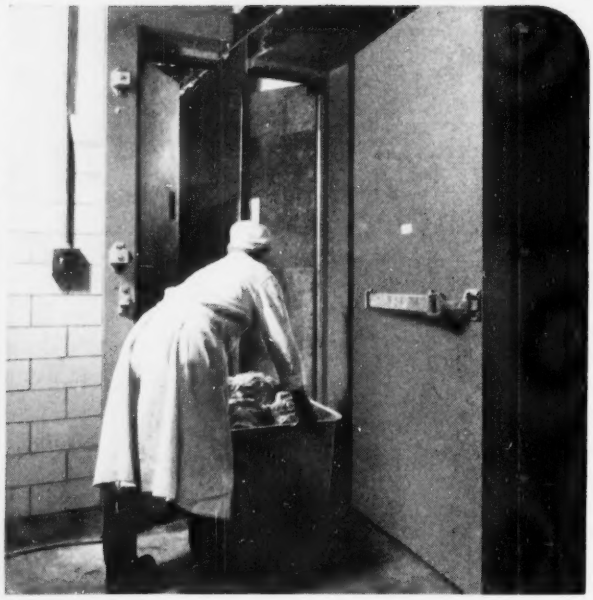


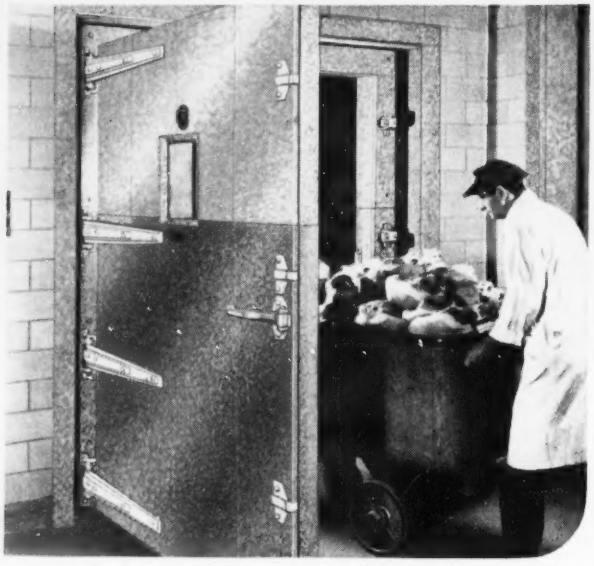
PATENTED HARDWARE—hinges, fasteners, bump open bars and door closers are designed and built by Jamison to meet the severe requirements of cold storage service.

why JAMISON DOORS are specified for PACKING HOUSES



THREE-POINT FASTENING INSURES POSITIVE SEALING. The pressure on the fastener side of this Series "50" Vestibule Track Door is kept equal to the hinge side by 3-point fastening. This assures a positive seal.

MAXIMUM STRENGTH AND RIGIDITY. These Series "50" Double Doors have extra strength and rigidity due to mono-panel construction with a box frame and one piece "Boat Hull" plywood panels front and back.



METAL CLADDING SIMPLIFIES CLEANING—where maximum sanitation calls for frequent washing down of floors and walls, complete metal cladding makes this possible for the door also.

Architects and contractors specify Jamison Doors because of their proven dependability and exclusive features that assure long trouble-free service.

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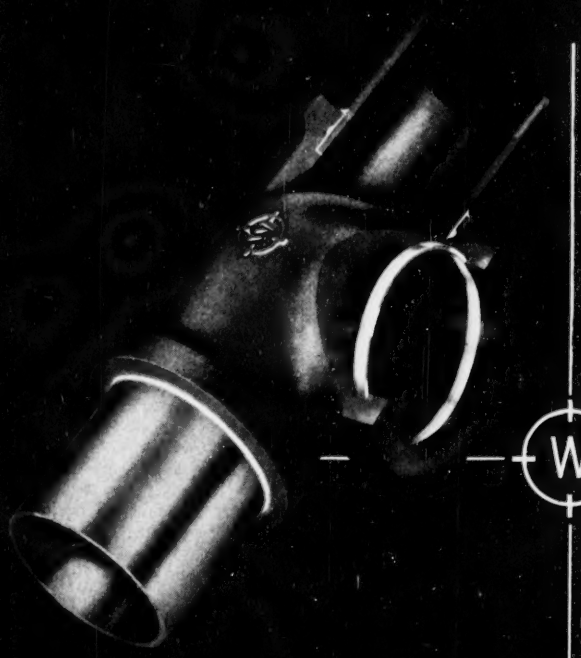

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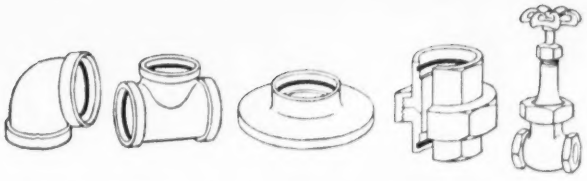
WALSEAL is a smooth-bore, bronze valve or pipe fitting having a **factory-inserted** ring of silver brazing alloy in the outlet or outlets. The brazed joint that results when a Walseal product is installed is leakproof, vibration-proof, and corrosion resistant. The alloy fillet that appears upon completion of the joint is visual assurance of **full penetration of alloy.** This improved method of joining brass, copper, or copper-nickel pipe or tube is another Walworth contribution to the progress of the valve and fittings industries.

In addition to its complete line of Walseal products, the Walworth Company manufactures complete lines of valves, fittings, unions, and flanges in a wide range of sizes and temperature-pressure ratings. The company also makes three lines of pipe wrenches, the Genuine Stillson, Walco, and Parmelee. Walworth products total approximately 50,000 items and are sold through distributors or agents in all parts of the world.



The sectioned Walseal tee illustrated, shows: (a) the fillet of alloy that appears upon completion of the Walseal joint. This fillet is your visual assurance of complete penetration. (b) the factory-inserted ring of silver brazing alloy. (c) sectioned view of the completed Walseal joint showing penetration of alloy both ways from the insert. Walseal joints can be made only with Walseal valves or fittings. For further details regarding Walseal products, ask for Circular 84.

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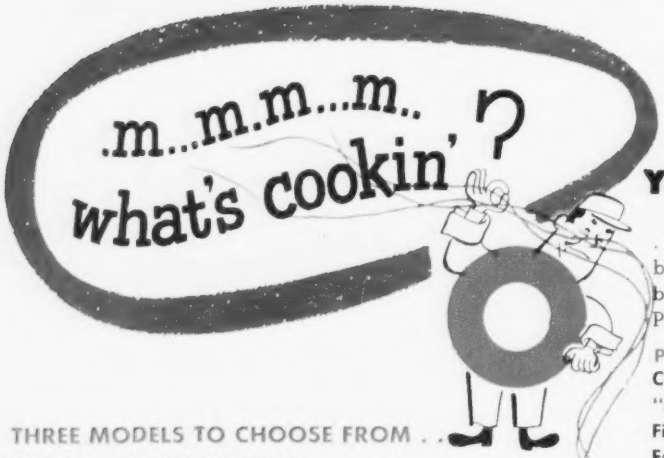

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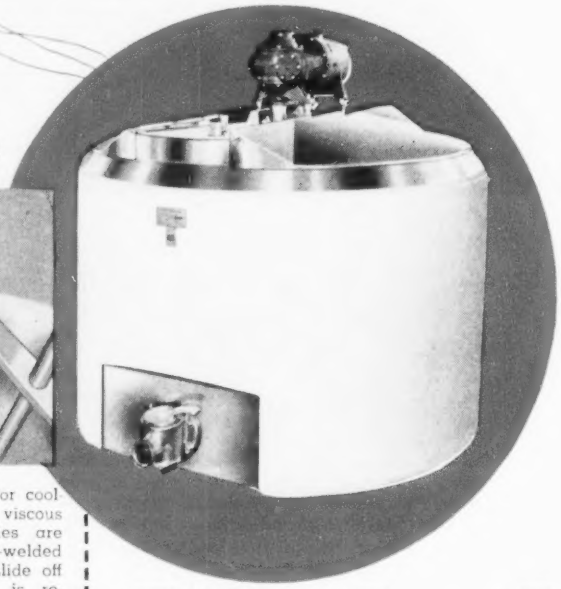
THREE MODELS TO CHOOSE FROM . . DEPENDING ON YOUR NEEDS

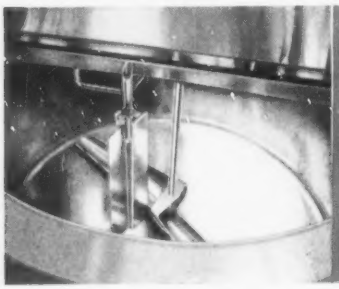
Model "WP": For fast, uniform heating to high temperatures with direct steam vapor or re-circulated hot water through spray rings at both top and bottom of vat. Rapid cooling with well, city, tower or sweet water. Capacity: 300 to 1000 gal.

Model "EP": Enclosed waterway pressure channels on sides and bottom assure fast heating with hot water or steam; efficient cooling with well, city or tower water. For low-temperature cooling, Model "EP" uses refrigerated water. Zone control available. Capacity: 300 to 1000 gal.

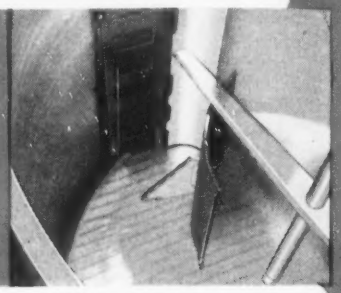
Model "DP": Only heavy-duty vat available that heats with steam vapor and cools by a combination of recirculated water and direct expansion. A self-contained, direct expansion combination cold wall and pump spray cooler. Best bet for low-temperature cooling where ice bank systems are not available. Capacity: 300 to 1000 gal.



CHOICE OF TWO TYPES OF REMOVABLE AGITATORS



Long Sweep Agitator: High back, stainless steel blades on removable agitator provide thorough mixing and blending. Feathered blade ends keep product from climbing walls, even at high speeds. Adjustable, removable baffle keeps foam at minimum. Two-speed agitator.



Scraper Blade Agitator: For cooling extra heavy bodied and viscous liquid products. Scraper blades are hard plastic, mounted in an all-welded stainless steel frame. Blades slide off for cleaning. Entire agitator is removable.

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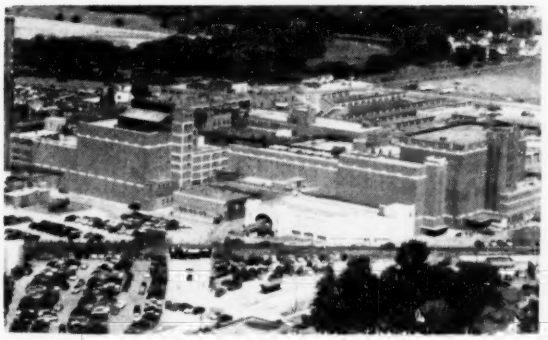


WINNER—Geo. A. Hormel plant in Austin, Minn., where process was developed, carried through pilot-plant stage, and into commercial use.

IDEA MAN—Need for process was visualized by H. H. Corey, Hormel president.

DEVELOPER — Service division, under L. W. Murphy, worked out method.

AN AWARD
FOR
FOOD TECHNOLOGY ACHIEVEMENT
TO
GEO. A. HORMEL & CO.
IN RECOGNITION OF ITS CONTRIBUTION TO THE ADVANCE OF THE INDUSTRY AND PROFESSION OF FOOD TECHNOLOGY, MADE POSSIBLE THROUGH A BROADER PARTICIPATION BY THE FOOD TECHNOLOGIST IN THE AFFAIRS OF
THE FOOD PROCESSING INDUSTRY
PRESENTED BY
FOOD ENGINEERING
JUNE 22, 1953

Progress Cast in Bronze

1953 Food Engineering Award for achievement in food technology recognizes Hormel's contribution to advancement of industry

OUTSTANDING current achievement in food technology, Geo. A. Hormel's hog-immobilizing process wins the 1953 biennial FOOD ENGINEERING AWARD.

Behind this signal honor lies a contribution to progress which mirrors the high purpose for which the FE Award was established.

A new and significant technical development with practical impact, the process represents a major advance in an important segment of the food industry. By the same token, it testifies to the importance of the profession of food technology and food engineering.

Contributing to efficient plant operations and better working conditions—as well as to product quality—the process exemplifies that broader participation of the technical man in the affairs of the industry which is so important to progress.

How Process Was Developed

As is fitting for an achievement award to a company, top management initiated this development. Hormel's president, Mr. H. H. Corey, suggested the need for improving working conditions and economics in meat plant operations prior to scalding.

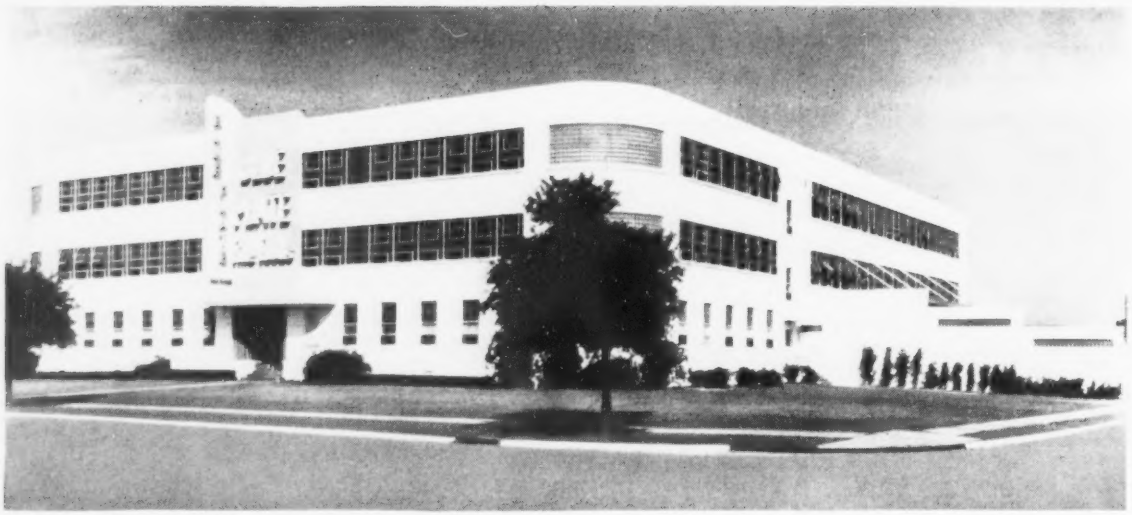
Inspired by their president's suggestion, Hormel's technical men, under the direction of L. W. Murphy, Service Division head, went to work. The first attempt at a solution involved driving the hogs onto a moving conveyor, in single file. This turned out to be but little improvement. So it was decided to inactivate the hogs with an anesthetic.

Several gases were tried—gases which would put the hog under but not kill it, such as carbon monoxide, nitrous oxide, carbon dioxide, ether, and chloroform. All were either deleterious, or involved economic objections—all, that is, except CO_2.

Next step was to build a simple wooden box with a door at one end to admit the hog and an inlet for CO_2. Success here led to a conveyor and small pilot-plant tunnel handling 24 hogs an hour. This permitted determination of gas requirements and investigation of physiological effects.

Finally—after much research, long

(*Turn to page 238*)



SHOW-PLANT in New Orleans, the modern Blue Plate factory connotes quality and sanitation. This connotation is no veneer. The plant is a model of good housekeeping and efficiency.

Rigorous control and process innovations add up as

Quality Plus Efficiency

For pace-setting Blue Plate plant in New Orleans, only best is good enough. New mayonnaise process typifies advances which greatly increase productivity

FRANK K. LAWLER
Editor, "Food Engineering"

To consumers in the South, "Blue Plate" means quality foods.

To the management of Blue Plate Foods, Inc., products carrying the company's label "are the best we know how to make."

To the observing visitor at the modern spic and span plant in New Orleans, the management has plenty of know-how. And more than that, it stakes its success on quality, not cut-rate competition. The price is determined by adding up the costs that go into quality, plus, of course, a reasonable profit.

Here you have a food business philosophy, or formula, that pays off for a progressive company which does two things: First, makes a fetish of quality, closely watching every factor involved, from ingredients to plant sanitation. Second, provides modern plant facilities and improves processes and equipment as fast as progress in food engineering permits.

This second factor not only is important to the first, but it is the means by which the cost of quality is kept within practical commercial limits.

We shall give you specific examples of Blue Plate's secrets of success. In so doing we also shall reveal advanced methods and equipment. But the main point to note is that everything is done with meticulous care and exacting thoroughness. This is no slip-shod business. That is primarily why it is a pace-setter—why it is an example for others who would build enviable consumer acceptance and make a profit doing it.

Let us start with the building itself. The accompanying exterior view tells a story in itself. The white concrete walls and encircling bands of windows and glass-block panels make the three-story structure a New Orleans show-place. Inside, white-tile walls, red tile floors, and stainless steel equipment combine with the great expanse of window area to make the plant a nice-to-go-to place for employees and a show-place for visitors. These features also aid sanitation and quality production.

In front of the building is an attractive lawn. And a one-story-high white concrete wall—with two step-downs and glass-block panels to please the eye—attractively encloses the loading docks and truck-parking area behind and alongside the factory.

No thin veneer of quality-connotation, this building houses equally neat operations. It is geared for the production of 63,000 lb. of peanut butter per day; 90,000 lb. of mayonnaise; 78,000 lb. of jellies and preserves; 72,000 lb. of margarine; and 45,000 lb. of salad dressing. It also produces French dressing, barbecue sauce, and other table sauces.

Productivity Way Up

Here are measures of the advanced methods: Last year the number of employees in the mayonnaise department had decreased 35 percent compared to the 1946 level. And the smaller force turned out more production.

In the jelly department, tonnage has been doubled with only two-thirds as many employees.

And in the peanut butter department, two-thirds the number of workers now produce twice as much peanut butter as was made in 1948.

With this sort of progress in productivity, you can see why the cost of quality does not price Blue Plate out of the market. And with that in mind,

let's see how quality is achieved. We'll take mayonnaise as the example.

Close Ingredient Control

Because this product is made of so few items—eggs, oil, vinegar, and seasonings—flavor particularly depends upon top quality in each ingredient and on extremely careful handling.

Only choice salad oil goes into the mayonnaise, and since the source is close by, oil is delivered frequently to assure freshness and to avoid long holding time in storage.

All eggs used are of a select grade, purchased directly from the large packers. They are packed during the months when egg production and egg quality are at their peak. The company has rigid specifications that must be met in the selection and packing of eggs. And these high standards gave rise to several improvements in packing of fresh frozen eggs, such as removal of tissue and other extraneous material.

Vinegar is of a special blend, and each tank car is checked on delivery to assure that it meets specifications.

Spices are purchased from leading quality houses, yet they are re-inspected in the plant laboratory. And it is a particular blend of spices and seasonings that gives the mayonnaise its characteristic Blue Plate flavor.

Pickle relish for sandwich spread not only is put up according to a special formula, but it is checked on receipt for color, texture, strength, and flavor.

Having carefully made a good product out of these A-1 ingredients, the company sees that it is sold while absolutely fresh. Production is geared to orders received, avoiding a large floor stock which might impair its freshness before delivery.

Mayonnaise beyond a certain age is taken off store shelves, returned to the plant, and processed to recover the oil. While this oil is not re-used, it is sold to a refinery.

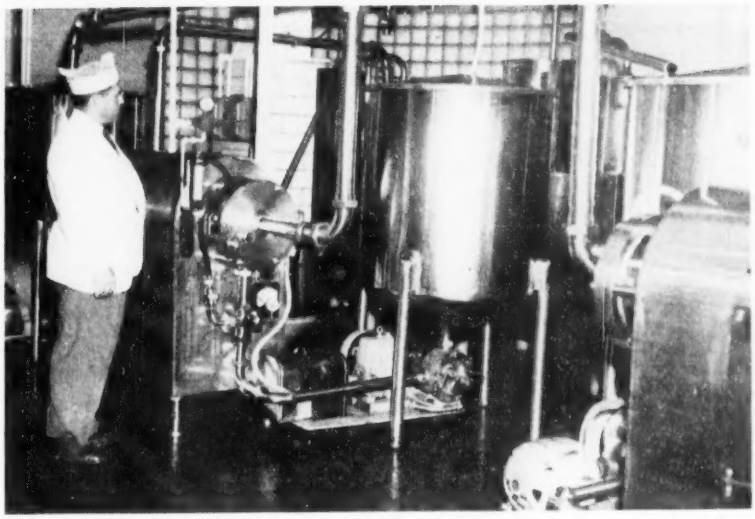
Ingredient quality is carried through to the finished product by sanitary processing conditions, by stainless steel equipment which avoids corrosion and metal contamination, and by not being touched by human hands.

Meticulous Plant Sanitation

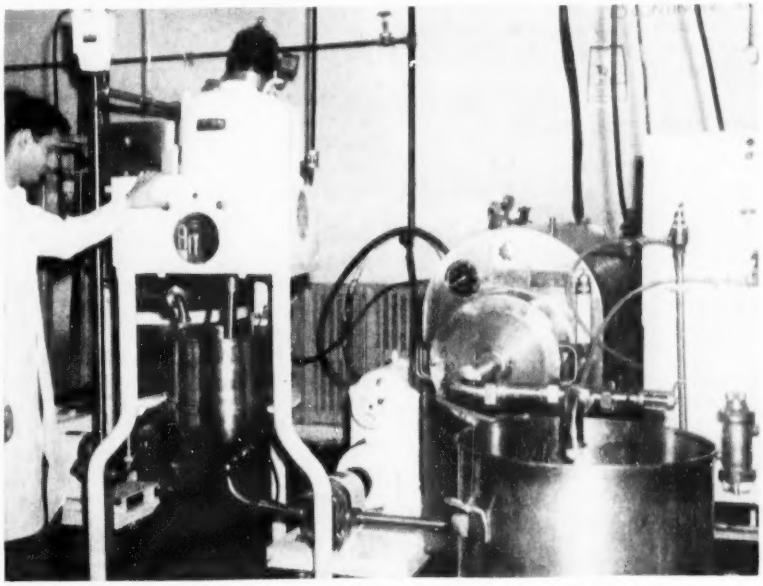
The plant is cleaned daily and follows a rigid sanitation program. And once a month, machines are completely taken down for maintenance.

Employees must pass a physical examination upon hiring and must have a physical check-up twice a year. They are supplied with neat, white uniforms, caps, aprons, and in some areas wooden-soled shoes. No excuse for

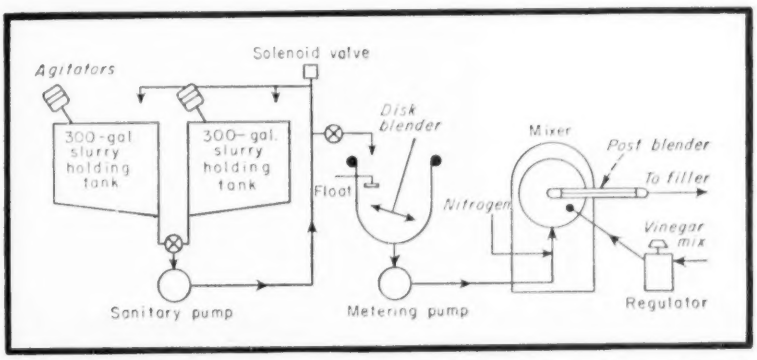
Outstanding New Mayonnaise Process



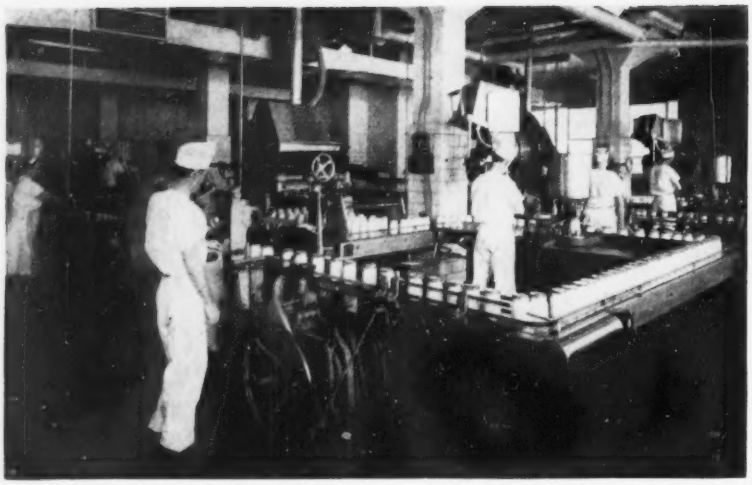
FIRST STEP in revamping mayonnaise process is shown here. Two Oakes mixers were installed to emulsify product in nitrogen atmosphere.



PILOT PLANT in AMF shops proved soundness of Blue Plate's idea for using Oakes mixer. New preblender is at left, mixer at right.



FINAL FORM of the completely revamped mayonnaise line, shown schematically. It is simple, sanitary, efficient, and operates at high capacity.



PACKAGING department is efficient and sanitary, too. Note how stainless steel shields are employed on filling-machine hopper.

personal untidiness or uncleanliness is accepted.

Combine all these quality-ensuring practices with close in-process and final-product checking. Then add quality-enhancing process methods. And there you have the Blue Plate quality formula.

New Mayonnaise Process

Comes now the final and most exciting part of the story: The new mayonnaise process.

To prepare better mayonnaise faster, Blue Plate has made the first commercial installation of the Oakes continuous mixer for that type of operation.

Mr. A. F. Sanchez, Vice-President of Blue Plate, desired a continuous mixer that would make a finely emulsified mayonnaise with good "body." His analysis of the problem indicated that the Oakes unit, which has a toothed disk rotating between toothed stators, would do the trick. So the problem went into the pilot plant of the mixer manufacturer for investigation.

The mixer performed as expected, and two of the units were installed last fall, the pair being operated at capacity on mayonnaise and salad dressing. To further upgrade quality by extending shelf-life, nitrogen was fed into the mixer heads to replace in-product air, the protective gas being supplied from cylinders at 60 psi.

In this initial stage of the mayonnaise process modernization, the premixed slurry of eggs, oil, spices and a portion of the vinegar content was delivered from a 200-gal. holding tank to the mixer head through a sanitary, positive-displacement metering pump. And after the 500-rpm. mixer rotor emulsified the premix in continuous flow, the product discharged into a second 200-gal. holding vessel. Then a second pump transferred the material to the supply tank of a gear-pump finisher, where more vinegar was incorporated to finish the mayonnaise.

Pre- and Post-Blenders

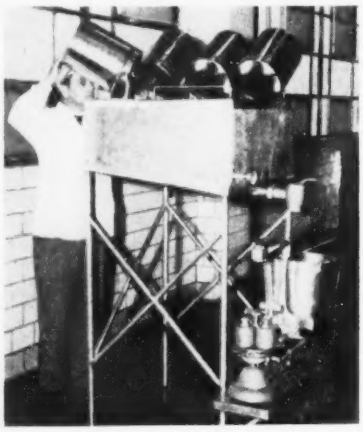
Next modernization step was to install a twin-disk, continuous, 40-qt. preblender between the first holding tank and the Oakes mixer. Developed by American Machine & Foundry Co., this small unit can convert as much as 8,000 lb. per hour of slurry to a uniform premix emulsion.

Simultaneously with the installation of the premixer, an AMF postblender was hooked up to the discharge end of the Oakes machine. And a vinegar premix unit was used to feed vinegar continuously into the Oakes mixer head.

With these added units, the finishing machine was eliminated, the product going directly from the postblender to the filling machine in continuous flow.

A word about the postblender. It is simple and compact, consisting of nothing more than a 14-in. long cylinder of 3-in. diameter with a 500-rpm. agitator inside. The agitator is simply a shaft equipped with paddles.

More should be said, too, about the vinegar unit. It consists of a 60-gal. tank, a vinegar-flow regulator, a flow meter, and a high-speed pump that delivers the vinegar to the mixer head.



PRACTICAL IDEA. Portable elevated tank holds cans of frozen eggs on rack while they drain through screen. Sanitary valve runs eggs into bucket on scale. Thermometer checks egg temperature.

Consistency Controller

Because it is important to quality control in the continuous operation, an automatic mayonnaise consistency control merits attention. An AMF "Watchdog" ammeter is connected into the circuit of the mixer motor. Detecting variation in product consistency by measurement of amperage drawn by the mixer motor, this unit stops the system and alerts the operator when consistency varies even slightly.

One final step in the process modernization schedule converted the mayonnaise line to the AMF "packaged" operation. This involved replacement of the slurry premix machine and holding tank at the start of the process with two 300-gal. slurry-makeup tanks equipped with agitators.

Now oil is metered from supply pipes into the makeup tanks, and the operator adds eggs, spices, and vinegar-water solution. After being mixed by the agitator, the slurry is meter-pumped to the preblender directly.

Two slurry tanks are used to achieve batch-continuous makeup, resulting in a completely continuous process.

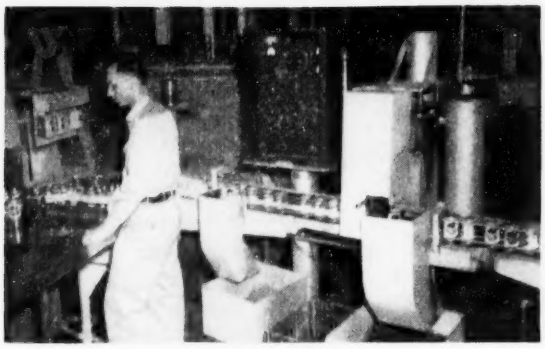
This improved mayonnaise process can be used also for manufacturing salad dressing. For this purpose, of course, starch cooking and cooling equipment is needed, Votator mixer-heat exchangers being quite suitable for this operation.

Pays Off in Benefits

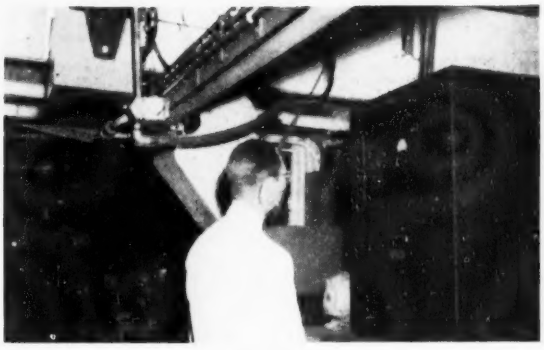
Many benefits are being realized by Blue Plate as a result of this advanced mayonnaise process. With the high-capacity, semi-automatic continuous line, relatively little labor and floor space are required, a highly sanitary operation is achieved, uniform product quality is assured, shelf-life is extended, and the product is produced in quick time.

Obviously, the advanced process engineering ideas of Mr. Sanchez and his production and quality control staff have been realized and are paying off in efficiency and quality "dollars."

Line installations . . .



BELT LEVEL assembly (right) checks cans after short run from pasteurizing exit, ejects faulty units into bin.



OVERHEAD installation (upper left) saves space. It monitors cans speeding on conveyor to casing.

Now Beams Monitor Fill-Levels and

Lift Barrier on Packaging Speeds

Precise X-ray gages are pioneered by Pabst—abolishing variations, weighing jam-ups on fast-action can lines

GLENN CRAM
Brewery Supt., Pabst Brewing Co., Milwaukee, Wis.

When it comes to packaging, Production calls, "*More Speed!*" Then Quality Control cries, "*More precision!*" . . . A two-headed objective that can cause ulcers in a Bottling Shop superintendent.

"How can I be sure of each container in lines running several hundred per minute," he complains. "And what eagle-eye inspector, or scale for that matter, will be able to judge fill to a gnat's-hair at 8 cans a second?"

At Pabst Brewing we have long recognized this dilemma and raised line speeds only when a safe method of preserving fill-precision could be applied. When filler speeds were more stately we posted checkweighers at each line. Later we weighed every can with automatic weighers—but these became impractical when line speeds moved up above 300 cans per minute.

Two years ago, with no ceiling on filler speeds in sight, we luckily interested scientists of General Electric's X-Ray Department at Milwaukee in the problem. Upshot is that today all of our canning lines are fitted with beam-type level monitors (FE Apr. '51, p. 135).

▶ These units are able to survey and eject underfills at up to 900/min.

▶ Are capable of detecting level variations of 1/29 oz. or less

▶ And almost completely free of maintenance and jam-up worries

Before detailing the new X-ray fill monitor and its performance in our plants, let us consider this problem of fill-level more closely.

First of all, excessive fill is no problem in most breweries, since filler design naturally obviates this condition. Of course the problem of overfill is of great concern in many other liquid and food packages, and we understand that the X-ray unit can also successfully deal with this condition.

Less than optimum fill in the can would, however, cause concern. And this problem becomes more acute as fillers are designed capable of increasingly higher speeds.

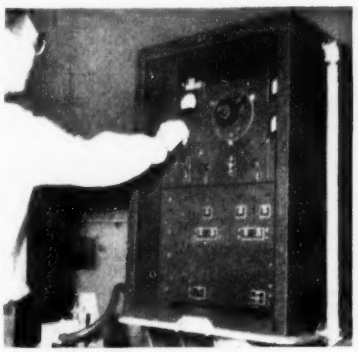
When we employed automatic weighers in our lines to control this condition, problems of maintenance and jam-up were ever present.

Further, aside from the need for higher speed fill detection, we have constantly striven for increased accuracy and uniformity. The overall object is, of course, to give the customer a dependably consistent full measure whenever he poured a can of our beer.

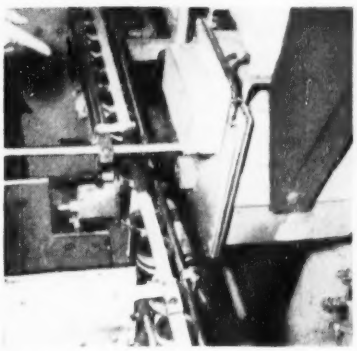
So came our need for a completely new approach to fill monitoring was threefold—to match faster line speeds,

(*Turn to page 179*)

. . . and component closeups

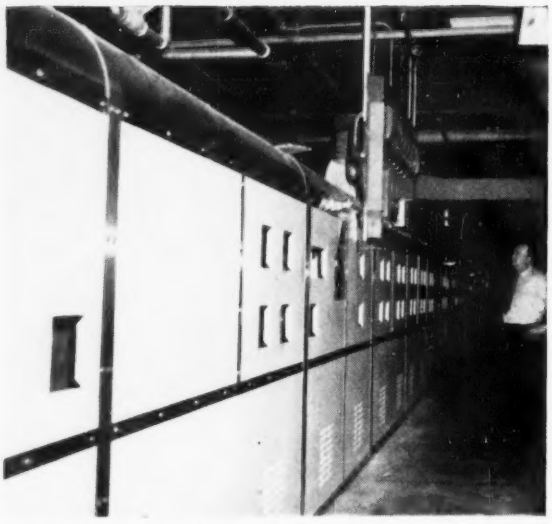


CONTROL panel has two knobs that trim sensitivity below 1/64-oz. fill.



AIR jet (pipe by beam unit) ejects cans. X-ray generator is at top.

SPECIALLY DESIGNED sheeter stamps out 9,000 2-in. cookies per minute. Multi-function machine rolls cookie dough into sheet, forms, and embosses cookies. Trimmings are cut into pieces and returned to pre-sheeter.



OF SIMPLE DESIGN, streamlined oven comprises 27 sections (8 ft. long). Developed by Author Earl Wood (right), panels are easy to remove in event of breakdowns. Oven features latest safety and temperature controllers.

NEW 1 ADDED TO *OLD 5*

Zooms Output a Third

Extra line at Burry's makes ten more tons of cookies daily than any one of original five lines . . . Radically designed sheeter, oven, and packaging units featured

GEORGE W. BURRY and EARL WOOD
President and Chief Engineer, Burry Biscuit Corp., Elizabeth, N. J.

By adding just one complete new line to the original five operated in our Elizabeth, N. J., plant, production has been increased one-third.

Formerly, 75 tons of cookie dough were processed on the five lines. Now, with the six-line setup we put out 100 tons daily.

Advanced engineering was applied to develop the latest equipment. So there is provided a continuous automatic process to turn out improved cookies at minimum operating cost.

Notable is the product uniformity achieved through better ingredient handling techniques and a high-speed cookie-dough sheeter and cutter especially designed for us. Too, a continuous band oven was developed by the engineering department and installed in the non-stop line. This new simply designed oven features advanced instruments for accurate control of temperature and baking time. It also includes the latest safety features.

Equally outstanding is our new packaging technique, devised to safeguard freshness and crispness of the cookies. They are packaged in moisture-proof cellophane in 4-lb. units, with four going into a carton that is then cellophane-wrapped.

Now for a step-to-step account of operations—with emphasis on the new cookie line:

Advanced Handling Practices

Latest methods are employed for bulk handling of flour, sugar, shortening, syrups, and water.

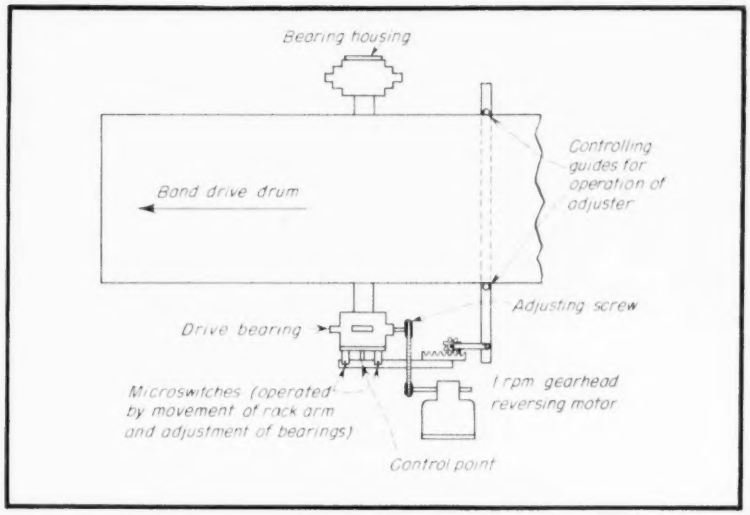
A recently installed Fuller Airveyor system efficiently moves 2,400 lb. of flour a minute from trucks to two 100 bbl.-capacity silos in the mixing room. Flours discharged from silos are automatically sifted prior to scaling into six 6 bbl.-capacity horizontal-type Read mixers.

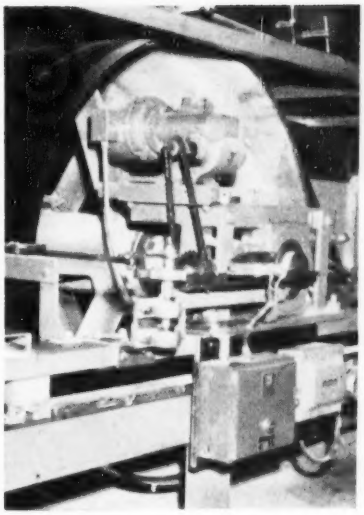
Sugar is received in 3,000 lb.-capacity aluminum Tote Bins, instead of 100-lb. bags. Chief advantages of these bins are greater efficiency in handling and storing, practical elimination of exposure to contamination, and little or no loss of product in transit.

Using steam, shortening is liquefied, and it is then pumped from tank cars into insulated, steam-coil heated storage tanks (6,000 and 10,000 gal.). Tanks are nitrogen-blanketed to protect shortening against rancidity.

As needed, liquid shortening is pumped to a brine-refrigerated, rotary drum that cools it to about 65 deg. F. A stationary knife then strips sheets of shortening from the drum. Dropping into a trough, the shortening is aerated as it is pumped into 20-lb. stainless steel buckets mounted on a scale. Plasticized shortening is now ready for the mixers.

Also handled in bulk is liquid sugar. Syrups, too—corn and invert. Facilities are provided for delivery by tank trucks and railroad tank cars. These liquid sweeteners are then pumped into 3,000-gal. storage tanks to be metered directly into mixers.


Bearing housing
Controlling guides for operation of adjuster
Band drive drum
Adjusting screw
Drive bearing
1 rpm gearhead reversing motor
Microswitches (operated by movement of rack arm and adjustment of bearings)
Control point



BELT ADJUSTER continuously corrects lateral misalignments. In so doing, it prevents damage to conveyor and cookies traveling through oven. Diagram shows working parts on adjusting device that continuously centrallizes stainless steel conveyor on drum. Adjusting devices located at both ends of 315-ft. conveyor were also designed by Wood. They correct misalignments up to 1¾ in. in either direction.

Water is fed from three lines—tap, hot (about 180 deg. F.), and cold (about 34 deg. F.)—into Spangler-type mixers. Conditioned to the desired temperature, the water is then metered into cookie-dough mixers.

We now come to the most advanced and streamlined operations in our plant—the new line featuring the high-speed cookie-sheeter and former, newly designed continuous oven, and "save-the-flavor" packaging units.

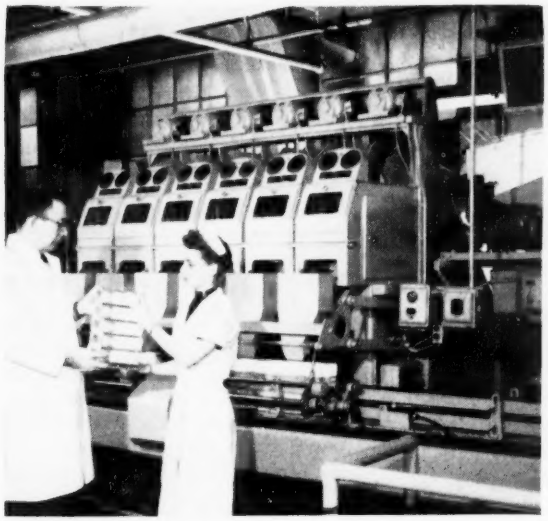
From mixers, cookie dough is dumped into a floor-level chute that feeds a spanking new Vicars dough-sheeter, cutter, and embosser. Specially designed for us, this machine forms cookies in this manner:

From a supply hopper, cookie dough is fed to a pre-sheeter—a pair of adjustable, stainless steel rolls (14x38 in.) that form it into a thick sheet. Traveling on a 38 in.-wide woolen conveyor, the dough sheet passes under a mechanical flour duster, on its way to two pairs of adjustable, stainless gage rolls. Here, dough is rolled to proper thickness.

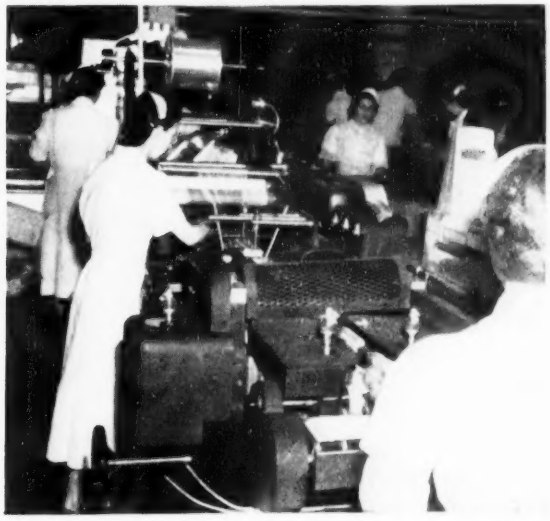
To curb downtime at the start of operations, the latter rolls are water-cooled or heated. They're warmed to prevent the dough from springing back during cold weather. And they are cooled in hot weather to prevent the dough from spreading too much.

Dusting flour is uniformly spread on the dough as it continues under a set of rotary brushes. The dough sheet then goes to a 300-stroke-per-min. reciprocating-type cutting head that also embosses each formed cookie. Size of the cookies determines the number

Efficient Packaging Machines Handle Volume Output



THIS six-headed weigher fills packages 70 to 90/min. Cartons then continue to automatic check-weigher and wrapping machine. Chemist collects samples for testing.



"SAVE-THE-FLAVOR" line. Stacks of cookies are cellophane-wrapped at 90 packages a minute. Four packets then go into cartons that are cellophane-overwrapped.

formed per stroke. In making 2-in. cookies, for example, a double-row cutter stamps out 30 per stroke, or 9,000 per min.

Trimmings are picked up by a transverse conveyor and carried to the side of the machine, where four rotary knives cut them into small pieces. Another conveyor returns them to the start of the machine for re-use.

Meanwhile, the cookies pass under mechanical sugaring and egg-washing devices. Comprising the first unit is a 3 in.-dia. corrugated roll that picks up sugar from a hopper and deposits it on the cookies. Similarly, a smooth, 4 in.-dia. roll transfers egg-wash solution from a hopper and onto the cookies.

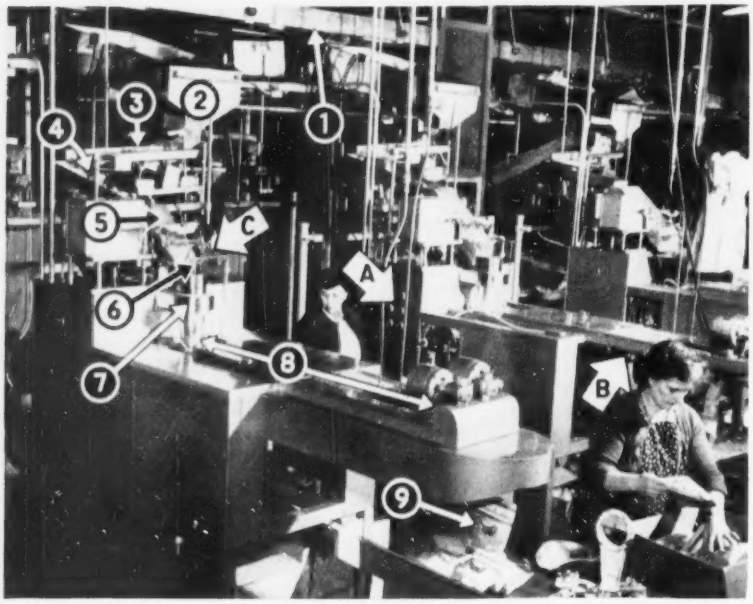
To avoid mechanical breakdown of the cookie sheeter and cutter due to lack of proper lubrication, a simple color code is followed by the oiler. This indicates frequency of lubrication of machine parts. For example, lubrication points colored red require daily oiling. Yellow-colored lubing points on gear boxes call for greasing weekly. And blue-colored lubrication on sealed bearings must be oiled every month.

Cookies are baked in a continuous straight oven (designed by Author Earl Wood). The oven uses a stainless steel, 316-ft. belt.

Provided ahead of the 220-ft. baking chamber of the oven is a 16-ft. exposed section of the belt, over which a wire cookie cutter or fig-bar depositor may be installed. With this arrangement, there is flexibility in the manufacture of different types of items on one line. The remaining 80 ft. of the belt at the end of the oven is also exposed.

Simply designed, the new oven consists of 27 sections, each 8 ft. long. Three sections comprise a baking unit, with ventilation units and burners. Six of the nine zones are equipped with automatic temperature control.

(*Turn to page 206*)



ENTIRELY AUTOMATIC, this new potato chip packager performs following mechanical operations: (1) Overhead shaker-conveyor delivers chips to unit. Feed hopper (2) supplies vibrator pan (3), which feeds chips to scale (4). Electronic gate (5) operates instantly when balance is tripped to stop product flow onto scale. Compressed air pipe line (6) opens bags. Chips drop from scale through conical hopper (7) into bags, and these are moved by belts through sealing unit (8) and drop onto casing table (9). Machine is controlled from panel (A). Endless belt conveyors can be seen under hood (B). And (C) is one of oil reservoirs that lube the five air cylinders in unit.

Battery of Chip Packagers Lops Labor Costs

FE STAFF

An installation of six new potato chip packaging machines is working to score unusual savings in labor expense for this operation. These new Pace Setter automatic chip packagers were installed at Blue Bird Potato Chips, Inc., Oakland, Calif.

Each unit has a rated capacity of up to 120 doz. bags an hour, depending on bag size. The new unit is designed to save up to two-thirds of packaging labor costs.

Chips from the cooker move on a wire-mesh belt conveyor to a shaker-conveyor located directly above the six packaging units. Made of lightweight stainless steel, the shaker-conveyor is counterbalanced to eliminate transfer of mechanical vibration to its building supports. It is practically noiseless in operation.

Above each packaging machine a pneumatically controlled gate opens to drop a measured supply of chips into the reservoir hopper at the top of each packaging unit. It feeds, by vibration, into a vibrating pan that provides a uniform flow of product to a chute leading to the scale. The direct feed from the vibrating pan to a new type of scale pan eliminates "free falling" of product and results in more precise weighing.

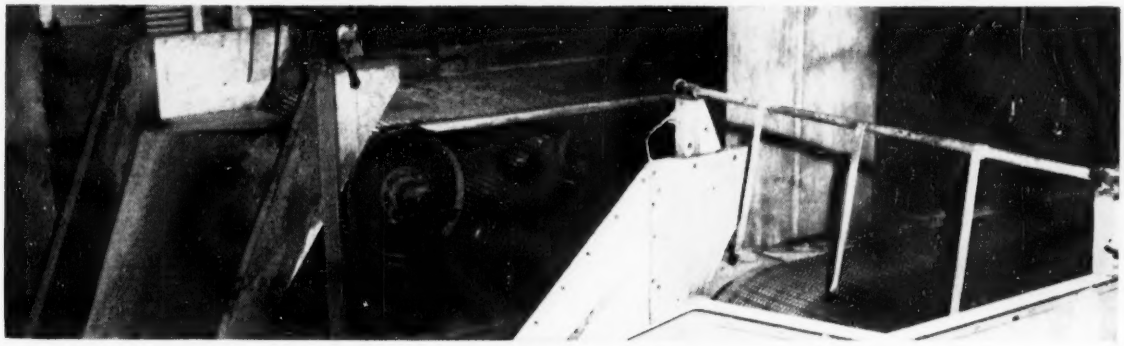
The scale assembly is mounted on vibration dampening supports. Its beam is supported by conical and knife-edge bearings to minimize friction and allow for expansion-contraction of metal. This construction also contributes to better accuracy.

Precise weighing tolerances are maintained by an electronic tripping control which operates the gate controlling product flow onto the scale. The gate provides a positive cutoff when the beam is tripped. The scale pan will not release product unless a bag is in position for filling.

Bags are picked up by automatic vacuum fingers. After the bag is mechanically positioned directly under the filling spout it is opened by a controlled air-blast. The filled bag is then grasped at its top by two parallel endless belts moving toward the exit end of the machine. These belts move the bag through the heat sealing unit, to the casing table.

The Pace Setter automatic chip packager is made by the Package Machinery Division of H. C. Little Burner Company, San Rafael, Calif.

THEY GO IN HERE. Treatment is regulated by electric controls.



THEY EXIT HERE. Controls automatically release bags to plant conveyor.

$250,000 for a Sterilizer!

But "D-Unit" for Bags Will Pay Its Way Fast

FE STAFF

Positive sterilization of empty fabric bags—with distinct advantages chalked up in new economy of operation and capacity—has been achieved by Eastern States Farmers Exchange, Buffalo.

The big stride was accomplished by replacement of the old chemical treatment with a single compound dielectric unit that is continuous and automatic.

This unit, true enough, entailed an extremely high capital expenditure—fully a quarter-million dollars. Yet its performance is so striking that Eastern States figures to amortize its huge outlay in hardly a decade through these outstanding benefits:

- **Absolute sterilization at 20 percent lower expenses for the operations.**
- **Extra capacity to meet expansion needs.**

Re-use of feed bags (average, five trips) results in large yearly saving for both mill and users. However, at the points of use of the bags and during their return trips as empties, there is constant exposure to pick up of molds and other microorganisms.

Hence, re-use is permissible only when there is highest sterilization before refill.

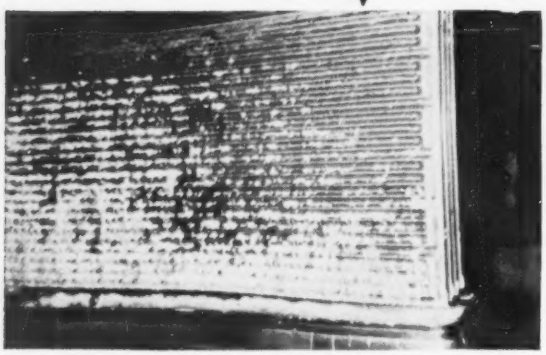
Advanced method of effecting this sterilization is the dielectric technique—which also may be applicable for treating other type containers and covers. Here is how the unit at Eastern States functions and why the $250,000 investment was deemed feasible:

New or returned bags, in compressed bales containing 250 sacks each, are lined up on the center of a wide wire-mesh conveyor, which carries bundles between dielectric electrodes at three successive sterilizing areas in the unit. Thus, heat within each bale is progressively stepped up at each station.

Time of exposure of the bales, under each of the dielectric heating areas, can be varied by regulating the rate of travel of the conveyor to any speed between 1 in. per min. and 33 in. per min. At 5 in. per min., time for bags to travel through the heat area is 60 min. A General Electric Thy-mo-trol—electrically operated variable-speed control—is employed to regulate conveyor travel.

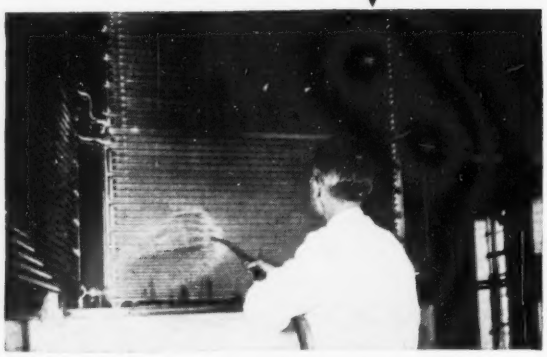
(*Turn to page 223*)

Milk Task ↓ **Performance** ↓



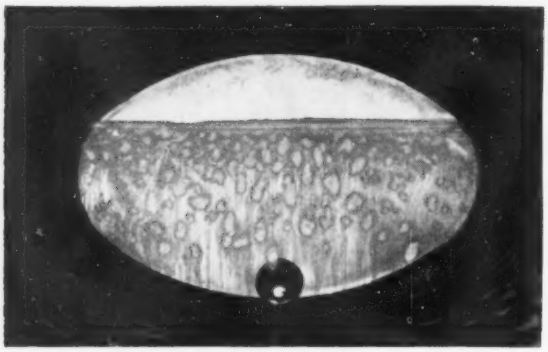
Stuck-up cooler . . .

Heavy covering of milk left from day's operations formerly took one man 1 hr. to brush clean.



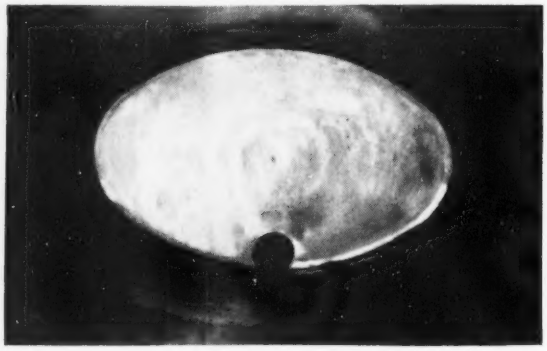
. . . swiftly decoated

But with spray of hot detergent solution, residue is removed without brushing—and in mere 30 min.



Clotted tank . . .

Gobs of foam, left behind when milk is withdrawn, previously presented difficult manual cleaning problem.



. . . washed to a sparkle

But rotary sprays that hit all surfaces with cleaning solution wash away the deposits—cut labor, materials.

Sprays *Put Zip* In Cleaning

Cleaning time in dairy plants cut 75 percent, materials almost as much, when hot detergent solution is applied with special pressure unit that eliminates hand brushing. Use also cited in bakeries, canneries, breweries, wineries, meat and poultry processing plants

RUDY FISKE and KEN C. TUCKER
Respectively, Sales Development and Food Industries Divisions, Oakite Products, Inc., New York City

One of the most important goals in food industry operation is: Best possible cleaning at lowest possible cost.

Toward that end, cleaning material manufacturers, engineers, and specialists in the field have devoted years of basic research and in-plant practice.

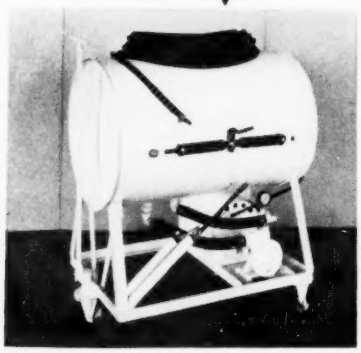
Needless to say, perfection has not been reached and probably never will be. But most certainly, very substantial progress has been made. In the last decade, compounded materials that combine water softening ingredients, emulsifying agents, and synthetic detergents with their rapid penetrating power and free rinsing, have made it possible to attain effective cleaning more easily and at lower cost than ever before.

Biggest news in food plant cleaning, however, is development of more efficient application methods. Before and during the war, very little spray cleaning equipment was used. Today, however, practically every branch of the industry has adopted it and more are joining the ranks daily. Hot spray cleaning is now cutting costs in dairies, bakeries, meat and poultry plants, canneries, breweries, wineries, and edible oil facilities.

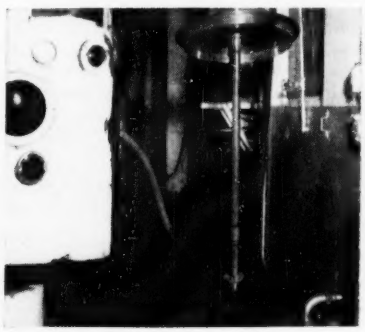
What's It About?

Precisely what is hot spray cleaning? Well, it takes several forms. One of the most popular units consists of a 50 gal. tank equipped with pump and

Unit ↓



HOT SPRAY UNIT is comprised of 50-gal. supply tank with ¾ hp. motor-operated pump that delivers solution at 50-75 lb. pressure.



ROTARY SPRAYER (fitted here to manhole cover for tank-truck cleaning) operates like lawn sprinkler and projects hot detergent solution to all corners of enclosed areas.

¾ hp. motor capable of spraying solutions at pressures of 50-75 psi. (see photo, top). Tank is filled with water and cleaning compound and is heated with an open steam line. The unit is mounted on wheels so it can be rolled to any site in the plant. Solution is delivered from a spray gun direct to the soiled surface. Heat of the solution and the mechanical force of the spray, plus the rapid penetrating powers of specially designed detergents, work on the soils simultaneously, causing them to literally roll off the surface. A hose rinse completes the job. Thus, time and labor of hand brushing are eliminated.

The foregoing is just a quick bird's eye view of hot spray cleaning. Let's see how it works on the job. A good spot to begin is the dairy business, which has embraced this method whole-heartedly. Take cold milk holding tanks for example. They can be cleaned easily with no brushing whatsoever. After a cold water rinse, the hot spray unit is used to cover all milk contact surfaces with a solution of special detergent heated to 140 deg. F. This is allowed to soak for 5 min. A hot water pressure rinse completes the job. The tank is, of course, sanitized by spraying with a suitable germicide before use.

Thus, where it previously took one man 30-40 min. to hand-brush the tank interior, he now turns in a superior, lower-bacteria-count cleaning job in 10-15 min.

The same method is used on pasteurizing vats, with tremendous savings in water, time, and labor. Here, extra attachments of the spray unit come into play. Two nozzles may be used interchangeably on the end of the gun—a wide-angle flat spray nozzle to cover large areas, and a distance nozzle to hit soil up to 20 ft. away. A quick disconnect coupling makes it simple to change from one to the other. A flexible hose gun extension also makes it easy to reach inaccessible parts of the equipment.

A preliminary warm or cold water rinse is followed by a hot detergent spray for 10 min. at 150 deg. F. After 5-min. soaking, the heaviest deposits are scrubbed lightly, then the entire vat is respayed for 5 min. A final rinse at 120 deg. F. for 5-min. completes the job.

Savings in Time and Material

At one large dairy on the West Coast, cost records revealed that the hot spray method reduced cleaning time from 120 to 30 min., with savings of several hundred gallons of water.

In addition to conserving time and labor, this cleaning also brings further advantages. For it takes the human element out of sanitation. Workmen don't have to climb into tanks or vats—all cleaning can be done from the outside. This is very good for two reasons: First, no one ever liked to see a man climb into a tank that soon would be filled with milk. Secondly, no man ever liked to stay there until a 100 percent cleaning job was done. If the deposits were tough and stubborn and hard to reach, and the air was warm and moist, the man became very uncomfortable. And chances are he often quit, saying, "Oh well, that's good enough."

The hot spray unit takes the guesswork out of cleaning. A prescribed procedure—so many minutes of spraying, at such and such a temperature, so much soaking time, proper cleaning material, etc.—produces a consistent result, regardless of the human element. It is this fact, plus the savings in time and labor, that has brought this form of cleaning such high popularity in so short a time.

Let's look at a few more case histories: A Nebraska diary cleans stainless steel butter-printing machines with the unit, charged with two special detergents. Machines are dismantled in the usual manner, with all the parts arranged on the floor, and then everything is thoroughly sprayed at 60 lb. pressure, 200 deg. temperature. Soaking time is 10 min., followed by the pressure hose rinsing.

Thus, the job is done in half the former time and the equipment is cleaner than it ever was. In fact, when this method was initially employed, the printing machine had to be reset because the hot spray method had cleaned places never reached before.

In a Seattle dairy, the new cleaning replaced 90 percent of all general hand cleaning. Over a six month period, charges came to only $144 against the former figure of $488—a saving of $344. Here, 4 lb. of specialized detergent takes care of 15 pieces of equipment. Previously 1-3 lb. of an all-purpose cleaning material was required for hand brushing each piece. Thus about 20 lb. of cleaning materials are saved daily. The new unit is used for all equipment, including the paper carton machine—always a difficult job.

What about bacterial counts after such cleaning? A good illustration is a recent test made after cleaning five milk holding tanks with one charge of the unit. The five tanks were cleaned in a total of 28 min. Swab tests were then taken on each tank, and after incubation the plates showed one tank with two colonies present and the other four with none.

Regardless of what food is processed—whether it be milk products, meat, baked items, carbonated or non-carbonated drinks, canned vegetables or fruits,—if there are wide floor and wall areas and/or long lines of equipment, all requiring periodic cleaning

(*Turn to page 222*)

HOW Rotary Sprayer Saves in Tank-Truck Cleaning (16,000 gal. milk handled, 11 tanker compartments washed daily.)

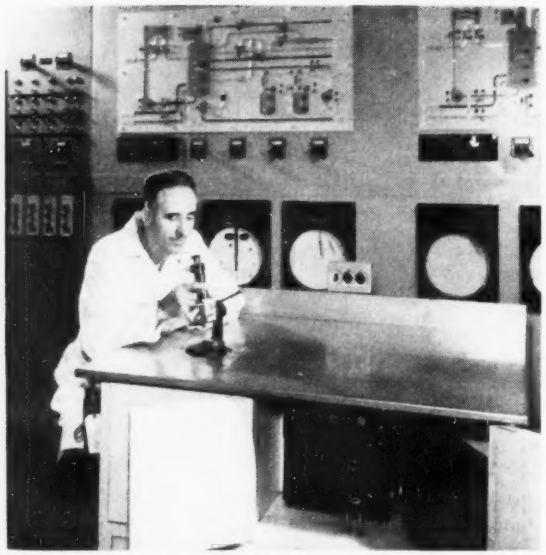
	With Rotary Sprayer		Hand Washing	
	Per Day, Dollars	Per Month, Dollars	Per Day, Dollars	Per Month, Dollars
Detergent	0.57	17.16	1.00	30.00
Labor	4.40	132.00	8.80	264.00
Total	4.97	149.16	9.80	294.00

TOTAL SAVINGS: $4.93 per day; $144.84 per month.

Better performance and product uniformity —plus maximum safety—achieved in hydrogenation by advanced instrumentation. Graphic panel permits central, one-man supervision of exacting process

W. T. FORCE and J. H. ELLIOT

Respectively, Canada Packers, Ltd., and Minneapolis-Honeywell Regulator Co., Toronto, Canada



DESK PILOTED PROCESS—Central desk for periodic optical refractometer tests of product in hydrogenation process commands full view of graphic instrumentation.

Complex Process

Converting liquid vegetable oils to solid fats through the addition of hydrogen under pressure, using a nickel catalyst, is a tough and exacting process.

Success of the operation depends upon many factors. Foremost, of course, is the purity and character of the materials involved. But even optimum preprocessing and precise metering of charge components will not serve as a panacea leading to predictable results in the subsequent sensitive and critical conversion process.

To tame this difficult unit operation in the Toronto plant of Canada Packers, Ltd., a system of robot devices was engineered into the process and a central graphic control panel designed which places the complete automatic cycle under the watchful eye of a lone, centrally located supervisor.

By thus completely eliminating the ever-present chance for human error, both the yield and uniformity of product are now dependably maintained at a constant high level. Further, a new maximum in plant safety has been realized.

But before launching into a detailed description of this automation, a brief word about the process itself and its function in plant operations:

Both vegetable oils and animal fats contain a considerable amount of unsaturated hydrocarbons. Due in part to this unsaturation, the fats are easily oxidized and develop rancidity. Hydrogenation, by partially saturating some of the unsaturated compounds, lessens the ease of oxidation, thus brings greater stability.

Adding hydrogen atoms also raises the melting point of certain oils—hence a liquid such as soybean oil can be converted to a solid fat with any desired melting point. Fats such as lard can also have their melting points adjusted to desired temperatures.

Further, hydrogenation also enables adjustments in the plasticity and texture of fats so they can be used for either shortening or margarine.

Accordingly, this process assumed added importance to the company when, in 1949, margarine was legalized in Canada. Its successful entry in the field was "Margene."

Process Facts

Canada Packers' hydrogenation process is essentially a batch operation consisting of several sequenced steps. Oil is first proportioned into a large vertical, steel cylinder. This is the converter, where it is heated and agitated. Then an oil slurry of nickel catalyst is added, and the head space of the vessel is evacuated.

When vacuum is removed, hydrogen is then bubbled through the oil at a controlled pressure until the correct hardness is reached.

Subsequent operations include further evacuation of the vessel and cooling of the batch, which is finally pumped out for filtering with a certain amount of recycling.

The degree of hydrogenation is controlled by taking samples and determining the refractive index with a refractometer. Such physical conditions of hydrogenation as temperature and pressure, amount of catalyst, and agitation must be carefully controlled since they affect the final product.

By adjusting the above process variables, it is possible to carry out a selective hydrogenation so that the less saturated hydrocarbons are reacted first. This increases the stability of the product without too much increase in melting point.

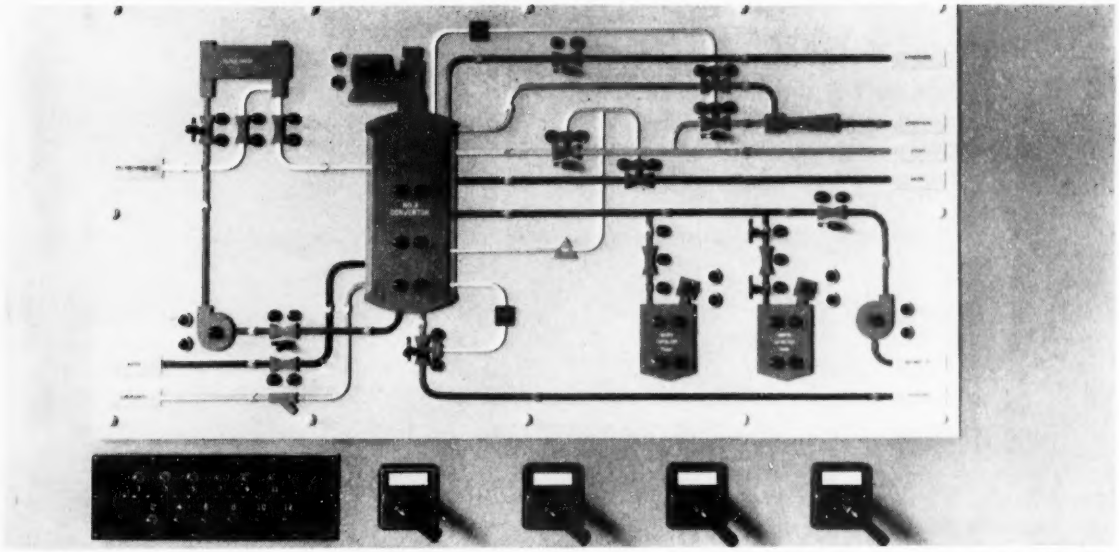
A laboratory check of the final hydrogenated oil is made to be sure that the iodine value and melting point are correct.

It can be readily seen that exact supervision and control of this process is of paramount importance in achieving and holding product uniformity. Complicating the control picture is the operation's complexity—the reaction is exothermic after sufficient heat has been applied to initiate it. Also, the possibility of equipment or personnel malfunction presents operational hazards that require an integrated safety system in the controls.

Programmer Does It

Because of the acute difficulties of manual operation, the company decided to place one converter under completely automatic control. Operation of this first unit provided the process information to make two more converters fully automatic, incorporating a slightly improved arrangement.

A seven-step electically driven program controller proved to be the mas-



CLOSEUP of graphic panel. It gives a complete picture of process layout, with all piping, valves, and pumps shown in miniature. There are identifying colors for flow lines, and lights indicate position or state of components. Bypass switches, seen below, permit hand operation of process from panel.

Yields to Robots

ter unit for sequencing the series of operations.

By pushing a reset switch, the operator sets the process in motion and the programmer moves to Contact No. 1, where valves open and oil is pumped into the main converter and an auxiliary catalyst mixing tank. The catalyst tank agitators are also started.

When oil reaches an intermediate level in the converter, the programmer indexes to Contact 2, where the converter agitator is started, steam heating of the oil under control of an electronic potentiometer begins, and a vacuum is drawn.

The oil, on reaching the high-level control point, causes the programmer to move ahead to Contact 3. Here the loading equipment is shut down, but vacuum is maintained and heating is continued up to a preset temperature, where the programmer moves to Contact 4.

At this point the slurry of nickel catalyst and oil is automatically drawn into the converter, with the flow being cut off by a low-level device in the catalyst mix tank. When this latter contact is tripped and a proper vacuum is still held in the converter, the programmer moves to Contact 5.

Action at this position consists of closing down the vacuum equipment and introducing hydrogen at a controlled pressure. At this point the reaction becomes exothermic and temperature is held by the controller by throttling cooling water rather than steam to the converter.

During hydrogenation, the operator takes frequent readings of product refractive index and pushes a button when he has determined that the proper degree of conversion has been reached. This advances the programmer to Contact 6.

This contact cuts off the hydrogen flow and draws a vacuum to clear this gas from the converter. Also, the water valve opens fully to cool the batch to filtering temperature.

When the batch is properly cooled, the programmer is actuated to its final position. Here, the vacuum equipment is shut down and converter vented to atmosphere. Agitation also is stopped, and the batch is pumped out for filtering, where a controlled amount of recycling is used.

When the converter has been emptied, the programmer indexes to a "dead" position, which shuts down all equipment, and the process is ready for another cycle.

Graphic Tell-All

Because of the relative complexity of the control sequence and the fact that five converters would ultimately be automated, it was decided to go to the new technique of graphic supervision at a central point.

Process layout panels were designed by Honeywell engineers to show equipment and flow in each hydrogenation operation. In addition to identifying colors for flow lines and miniatures of valves and pumps, the panels were equipped with signal lights to indicate whether valves were open or closed, pumps and agitators running, vessels full or empty.

Thus, at one quick glance the operator on duty gets a complete picture of the stage of operation of any converter and at a central desk.

This desk houses the important temperature-controlled refractometer tester, so one man now effectively controls the hydrogenation plant.

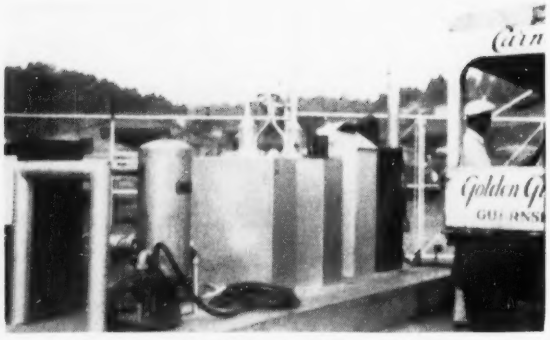
As an extra safety factor, provision has been made so that the operation can, if necessary, be carried out manually by either of two methods. First, if one of the critical instruments fails, the operator can open or close valves or start and stop motors by manipulating switches on the panel.

Pushbuttons on the panel incorporate small-size, high-amperage microswitches. Hence, valve positions will be indicated on the panel—despite the fact that the control instruments are out of service—because the system of microswitches that actuates the signal lights operates independently.

Second, for use in the event of air failure to the system, which would prevent remote manual operation of control valves, bypass valves have been located to permit process-site adjustments.

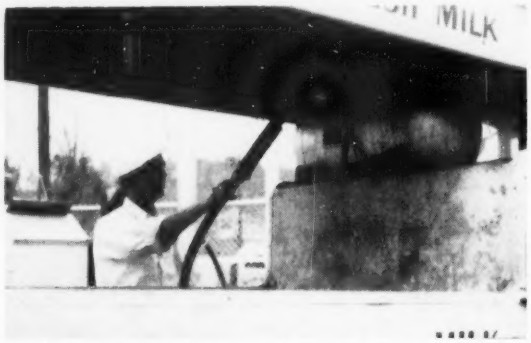
Auxiliary operations are performed by microswitches. For example, all valves are interlocked so that the operation cannot proceed if any valve is in other than proper position.

LPG retail trucks. Fuel tank is atop compartment inside.



FUELING island—fed from 6,000-gal. underground tank.

CARNATION OK'S LPG



IN GOES fuel. Tank can withstand pressure of 250 lb.

Says liquefied petroleum gas—fueling its 210-truck fleet for more than a decade—has increased engine life, lowered maintenance, upped miles per fuel dollar, and cut use of oil

FOOD FIELD operators bent on weighing the "pros" and "cons" of substituting LPG (liquefied petroleum gas) as a fuel for their truck fleets may well give pert consideration to the strong "pro" factors now cited by W. J. Thompson, manager of automotive equipment, Carnation Co., Los Angeles.

Performance results, which he recently reported to the Motor Vehicle Section of the Milk Industry, are based on data accumulated over 13 yr. of operating a fleet of 210 vehicles ranging from retail milk route trucks to overland tractor-trailers.

He has indicated these advantages when a truck fleet is converted from gasoline to LPG:

★ **Lower per-mile fuel and lubricant costs**
★ **Longer engine life**
★ **Minimum clutch repair and replacement**
★ **Fewer cracked blocks and cylinder heads**

Carnation's first tests were made on a single converted truck. Then after favorable results with three more, the company's entire fleet was altered for LPG—including retail, wholesale, and ice cream trucks, pickups, and tractor-trailer units of 76,000 lb. gross load.

Normal per-mile fuel consumption of trucks powered with LPG averaged about the same as with gasoline. However, present cost of the liquefied gas is 25-30 percent less than gasoline. And since the recoverable reserve of the LPG is considered to be in excess of the gasoline reserve, there is reason to expect that the relative price of the gas will remain attractive. Mr. Thompson reported Carnation buying LPG at 7¢ less per gallon than regular grade gasoline in late '52.

Comparative Merits

At atmospheric pressure, gasoline is normally a liquid which is largely converted to a gas by the engine's carburetor. When the motor is at optimum operating temperature, conversion of liquid gasoline to a vapor may be complete. However, when the engine is cold, when it is choked, or when the carburetor is improperly adjusted, some liquid gasoline enters the combustion chamber. Lubricant is then diluted.

This thinning of the lube, along with abrasion by carbon from imperfect gasoline combustion and lead residues from ethyl gas, contributes to engine wear and early major repairs.

LPG, normally a gas maintained in liquid state by pressure (150-190 psi.), enters the engine's combustion chamber dry. As speedometer miles pile up using this liquefied gas fuel, lubricating oil tends to thicken rather than thin. And since there are no residues of carbon or lead compounds, wear of moving engine parts is minimized. Much less carbon monoxide is produced by LPG combustion, and gone are fumes and smoke from the exhaust.

Performance Results

Mr. Thompson reports engine longevity increased two or three times with use of LPG in Carnation's house-to-house delivery trucks. In this work, excessive ratio of idling to running

time results in unusually heavy wear in gasoline-burning engines.

Before the company's fleet was converted, 20,000-25,000 speedometer-miles on home-delivery trucks was the limit period between engine overhauls. In comparison, consider one of the converted retail-route trucks. Recently overhauled, it had operated without interruption for 9 yr. and had covered 76,000 speedometer-miles. And its engine block proved to be in good shape—worn out of round less than 3/1,000 in.—while its crankshaft was still "standard."

Because there is now no lube thinning, it has been determined safe practice to retain motor oil in retail and wholesale route trucks to 6,000 mi.—and on the big over-the-road tractors, to 8,000 mi.

Nevertheless, a safety-checking procedure is followed: A sample of oil is drawn from the engines and tested every 1,000 speedometer-miles. Separate tests reveal that oil occasionally remains serviceable after as much as 16,000 miles.

Diminished trouble now experienced with clutches is attributed to less tendency of drivers to "slip" the clutches of their engines to induce them to pick-up on cold mornings.

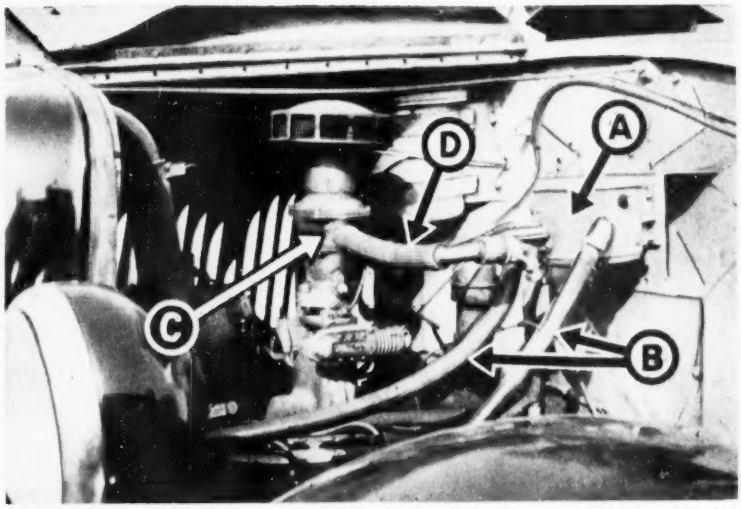
Decrease in cracked blocks and heads is a benefit resulting from an inherent characteristic of LPG. The new fuel must be heated before it is properly vaporized. This warming is accomplished in the "regulator" (a combination vaporizer and pressure-reducing device) by a jacket of water from the engine. Now, therefore, if loss of water from the engine cooling system should permit engine overheating—usual cause of block and head cracks—LPG is insufficiently warmed in the regulator for adequate combustion. And the motor stops before the engine can be damaged.

Carnation applied and tested four different makes of conversion units, and all proved satisfactory. Included were combination-type units, which by the mere flip of a switch will shift from gasoline to LPG, or vise versa. Advantage of this "switch" unit is that trucks so equipped may be transferred for use at branch plants outside Los Angeles where LPG is not yet supplied.

Conversion Investment

Cost of fitting a truck for LPG will vary with the type of converting unit, make, and type and size of truck, capacity of fuel tank, etc. An average cost of $224.50 was cited including the following:

Regulator	$69.50
Carburetor	15.00
25-gal. fuel tank	65.00
Filter	4.00
LPG lock-off	15.00
Copper tubing, etc.	15.00
Machining head	6.00
Labor	35.00
	$224.50



CLOSEUP of installation using butane-form LPG. (A) is regulator, (B) hot water hoses from engine, (C) butane carburetor, (D) butane vapor hose.

An additional $16.00 for the combination unit brings the average for that type to $240.50. The item of $6.00 for machining head (see list) covers necessary expense of increasing compression ratio from 6.3 to 1 up to 7.5-7.8 to 1. High compression, increasing efficiency, is possible without ping or knock, when LPG is the fuel because of the high octane rating of the gas.

When pure propane with an octane rating of 110 is available as fuel, a compression ratio up to 9-10 is satisfactory, with no knocking. However, in many areas, especially in the South where LPG contains considerable butane and has an octane rating of 95, a compression ratio of 7.5-7.8 is the limit.

Since LPG is not dispensed at every filling station, the fuel tank for the liquid gas should have greater capacity than when gasoline is the fuel. One of 25 gal. is generally suitable for small trucks—multiple units of the same size can be installed on long-distance haulers.

Although blow-offs and other type control devices are installed, the tank must be constructed of heavy gage metal to withstand pressures up to 250 psi., since LPG is liquid only under pressure (150-190) through normal temperature range.

When a fleet of trucks is fueled with the new gas, dispensing facilities are necessary. Carnation stores LPG in a 6,000 gal. tank installed at a cost of approximately $3,500. Dispensing is from a specially designed and constructed service island.

Conversion Procedure

Several preliminary investigations should be made by those considering use of LPG as motor fuel. Before actual planning of conversion, location of the source of supply should be known as well as facilities for deliveries.

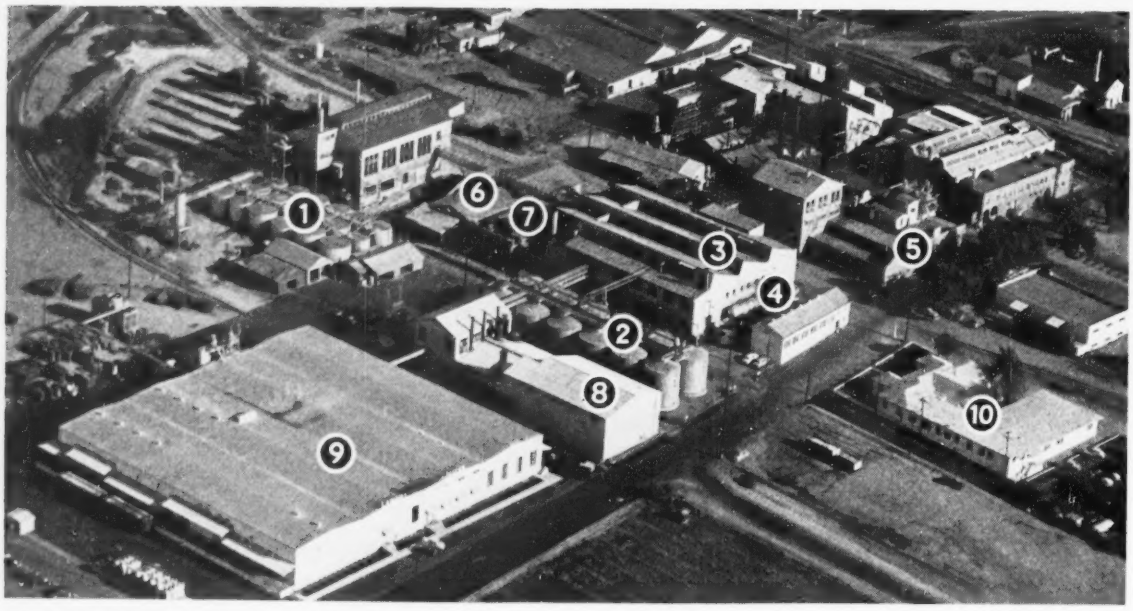
Composition of gas to be used is an important factor, since engine changes will be determined by the proportion of propane and butane in the gas and the corresponding boiling point and octane rating (butane boils at 32 F., propane at −44 F.).

Also advisable is a check of zoning regulations before further commitment. Storage of LPG above ground is prohibited by local legislation in some areas.

When the decision is made to convert, valves in each engine should be ground and the motor completely overhauled. Spark should be advanced approximately 10 deg., and it may be advisable to replace "hot-spark" plugs with those of cooler type.

Training mechanics to repair and adjust the converted engines is no problem if members of the crew are capable mechanics on regular gasoline engines.

Lastly, storage tank for the liquid gas should be erected (either vertical or horizontal) above ground to permit access to valves and fittings and to facilitate inspection by city and state authorities. (Also see "Bottle-Gassed Trucks Give Them More Delivery Miles Per Dollar," FE Mar. '52, p. 139)



INTEGRATION-PLUS is achieved in this streamlined West Coast fruit-processing facility. Components: (1) Lemon juice fermentation tanks; (2) calcium citrate storage tanks; (3) neutralizing and decomposing department; (4) sulfuric acid tanks; (5) acid house; (6) fruit receiving and grading; (7) fruit storage; (8) peel dryers; (9) new juice-product building; (10) offices.

Their Waste-Salvage Process

Balances Multi-Product Operation

Flourishing "six-sided setup" is profitably linked by production of quality citric acid from lemon culls

HOMER H. HOLTON and C. R. HAVIGHORST
Respectively, Chief Chemist, Exchange Lemon Products Co., Corona, Calif., and Senior Associate Editor, "Food Engineering"

Key to economic stabilization of operations at Exchange Lemon Products Co., Corona, Calif., is production of citric acid—which can be manufactured to high quality standards from every lemon not needed for other products.

Thus, citric acid, the company's original commercial product continues to retain an essential place in Elpco's successful multi-product operations, described in two earlier reports dealing with the production of juices, oils,* and pectin.**

In output these latter three products completely overshadow the remaining three—citric acid, brined peel, and peel dried for stock feed. But, while the plant is not strictly engaged in byproduct manufacture, one of its major values to the lemon growers lies in the maintenance of a delicate balance of fresh supplies through diversion of lemons to these multiple processes.

And through this versatility, seldom found in industry, the growers no longer fear market gluts during years of overproduction. Also, since fruit diverted to the plant can be processed into a number of products, according to market demand, it is a rare occasion when raw material must be wasted.

In manufacturing citric acid from lemon juice, Elpco was America's pioneer concern—and today it is the last. For other organizations utilizing sugars as raw material developed a restrictive competition with which only this company now contends, and then just on the byproduct basis. Its annual production of citric acid ranges to 2,000,000 lb., and of calcium citrate to some 3,330,000 lb.

How Raws Are Handled

In this closely integrated operation the major division of raw material flow occurs at the fruit storage bins. Here, by quality and grade, the fruit is routed by conveyor to the juice extraction operation or to the lemon grinders. Juice from the extractors is pumped to the new juice building and is either heat processed or frozen.

*A. Harris Kieser and C. R. Havighorst, "They Use Every Part of Fruit in Full Product Line," FE Sept. '52, p. 114-116. Also Flowsheet "How Lemon Oil Is Made," same issue, p. 136-139.

**Glenn H. Joseph and C. R. Havighorst, "Engineering Quality Pectins," FE Nov. '52, p. 87-89. Also Flowsheet "Making Pectin From Lemons," same issue, p. 134-137.

Full Perspective

—of Elpco's top-efficient steps in making citric acid is offered in this month's FE Picture-Flowsheet (pages 162-165)

Peel cups of accepted quality, remaining after juice extraction, comprise the raw material for the peel brining department. All other fruit is routed to the lemon grinders, which extract the oil and juice. Oil picked up by the juice in the grinding process is removed by centrifugal separators. Juice is then pumped to storage tanks as the first step in the citric acid process. Peel from the grinders is usually flumed to the pectin plant but can be diverted to dryers to be made into stock feed.

De-oiled lemon juice is held in these storage tanks about a week. During this time natural enzymes in the juice destroy the pectin present, and the almost colloidally dispersed and suspended fine pulp particles become discrete, separate, and tend to settle. During this holding period there is a simultaneous fermentation of the sugars contained in the juice. Bubbles evolved by fermentation buoy most of the pulp particles to the top of the tank, where they collect into a cap. There is a smaller layer of sediment that collects in the bottom of the tank.

"Juice distilled" oil is recovered from a portion of the juice before it reaches the storage tanks. The temperature required for distillation is high enough to inactivate the enzymes in the juice and thus prevent destruction of the pectin and subsequent clarification of the juice. For this reason it is important that only a portion of the juice be run through the still. Some raw juice must be mixed with the distilled juice to allow enzymatic action. It is also necessary that the hot juice from the still be cooled before it is sent to storage.

From an outlet near the bottom of the tank the aged juice is then pumped to the 10,000-liter neutralizing tanks for further treatment. When the lowering liquor level brings the pulp cap to the outlet, the flow is diverted to juice filter tanks. Filter aid then is added to this very pulpy juice to facilitate filtration for pulp removal. Heated by live steam, the mass is boiled an hour or two to bring about a coagulation of the pulp particles. This facilitates the filtration of the mixture in plate-and-frame presses. The filtered juice is pumped to the neutralizing tanks.

Acidity Controlled

Juice from the storage tanks will drop below 6 percent acidity due to dilution from condensed steam during cooking in the neutralizing tanks. And since acid recovery percentage is higher and handling is more efficient with juice at 6 percent acidity, filtered mother liquor is added to the material to fortify the acidity.

This mother liquor is returned to the neutralizing tanks from the crude acid cycle at the acid house. It has been diluted to 100-200g. acid per liter to precipitate some of the gummy constituents, limed sufficiently to remove most of the sulfuric acidity and precipitate gypsum, then heated and filtered.

This mixture is heated in neutralizing tanks by 20-lb. steam discharged near the bottom of the tank. The juice is allowed to agitate for 1 to 2 hr. just below the boiling point, to promote coagulation of the remaining fine pulp particles. Then a thick aqueous suspension of lime is added to precipitate calcium citrate. The lime slurry contains about 3,800 lb hydrated lime to 1,200 to 1,300 gal. of slurry.

An experienced operator notes the rate of disappearance of dark color, the point at which the lime contacts the juice. Thus he judges quite closely when the endpoint or neutrality is near. He stops the liming when there is a residual acidity of 0.05 to 0.20 percent. The acidity is determined by titration. Any necessary adjustments are made to reach the desired range by additions of lime or of juice. Preferably the juice is never over-neutralized.

The slurry is pumped to plate-and-frame filter presses, from which the filtrate is discarded. The cake (citrate being but slightly soluble in hot water) is washed in the press with hot water and the press is blown with air for further drying.

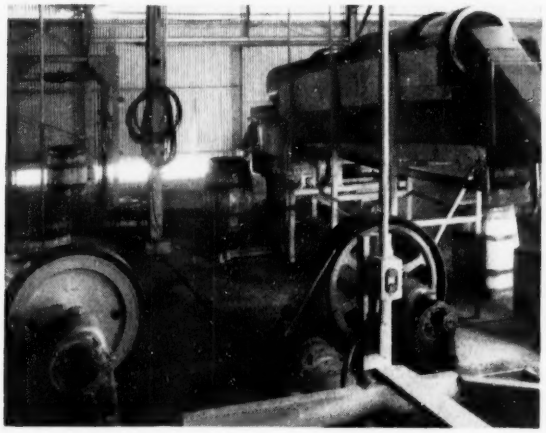
Dry Storage Provided

That portion of calcium citrate not needed immediately for the citric acid process is dried in a two-stage rotary dryer. Dried citrate can be stored indefinitely without change. The wet citrate first encounters a hot air blast in the gas-fired stage of the dryer. It then passes through the second stage that is heated by longitudinal steam pipes arranged along the wall of the dryer. The air discharged from the first stage is at 100 deg. F and from the second stage 80 deg. F.

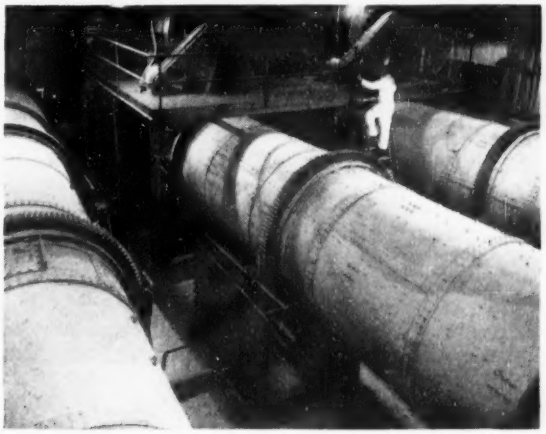
Dust in the air drawn from the dryers is collected in a cyclone, carried down by a water spray, and collected in a sludge tank. Periodically this sludge is returned to the citrate decomposing tanks.

Dry citrate not to be converted at once into citric acid is conveyed to a hopper. Here it is either filled into 80 lb. bags for shipment or fed by a Jeffery vibrating feeder onto a continuous scale, passing at 30 lb. per minute. This flow discharges into a bin, from which it is blown into a portable cyclone delivering to a screw conveyor and thence into one of twelve steel storage silos. A return line from

PEEL PROCESS UNITS: Dicing . . . . . and drying



IN MAKING brined peel, stamping machines, (foreground) dice product. Rotary screens (top) removes fines.



MOISTURE is extracted from ground peel in this gas-heated three-stage dryer. Heat and product flow are concurrent.

the top of the cyclone brings dust to a separator and sock filter in which it collects. This dust is then conveyed to the storage silos.

Dry citrate from storage is sucked from the tanks, by-passing the cyclones, and is discharged into a bin. Here it is weighed into bags for shipment or is conveyed to the decomposing tanks for processing.

Cake Decomposed

Citrate cake for immediate citric acid processing is conveyed from the filter press to a decomposing tank containing the correct amount of wash water resulting from an earlier filtration. In order to decompose the citrate and free the citric acid, sulfuric acid is added slowly to this slurry until a methyl violet indicator paper shows presence of an excess of mineral acid. This reaction is not rapid and some adjusting is required in order to produce a final citric acid liquor with citric acidity comprising about 95 percent of the total acidity.

The precipitated calcium sulphate is very fine and filter aid is added. This slurry is pumped to a plate-and-frame press, where the gypsum is separated from the citric acid liquor.

The clear citric acid liquor contains about 250 g. citric acid per liter. But, due to dilution from wash water in the press it is reduced to about 150 gpl. This weak liquor is then pumped to the acid house.

When the presses become filled with gypsum they are blown with compressed air for 15 min. to remove all liquor possible. Previously accumulated wash water is pumped through the press and saved in the weak liquor storage tanks until the press discharge has dropped to 3 deg. Washing is then discontinued and the press is again blown 15 min. City water is then turned into the press until the effluent acidity is below 0.1 percent. This wash water is used to cleanse the next press or to suspend calcium citrate for decomposing.

The press finally is blown for 15 min. and the gypsum is conveyed to a tank, where it is mixed with water to form slurry, then pumped to gyp bed.

The weak citric acid liquor is drawn

(*Turn to page 175*)

W&T Research Head John C. Baker (left) spurred new continuous bread dough process now going into six bakeries. President Wm. J. Orchard (right) displays improved bread made by the technique.

Radical Method of Preparing Doughs

Shortens Bread Making

From mixing to panning takes about 2 min. Abolished are conventional mixers, dividers, molders, overhead proofers, dough troughs, fermenting rooms. Quality of bread termed materially improved.

A CONTINUOUS bread-dough making process—now past the pilot stage—will be installed this summer in six eastern bakeries. This revolutionary technique will make it possible to operate a fully automatic bakery from a central control panel.

The method and its benefits were portrayed by William J. Orchard, president of Wallace & Tiernan Process Co., at a recent meeting of the Millers' National Federation in Chicago.

Named after its inventor, W&T's director of research, the John C. Baker Do-Maker Process is reported to—

- **Solve the sanitation problem.**
- **Provide complete, automatic control of flow.**
- **Control absorption—and flavor.**
- **Avoid over- and under-fermented doughs.**
- **Assure striking savings in equipment, power consumption, processing time, materials, floor space, and structural requirements.**

But one overall advantage is seen outweighing even these benefits. That's ability to make a better bread. Reportedly, the loaves are tastier and more attractive, hence should decidedly up sales.

Key to the new process is fermenting of the liquid ingredients making up the dough and not the mixture of liquids and flour. Thus good flavor comes from proper fermentation—instead of being lost in baking. Too, the process becomes continuous, thereby eliminating the time required for dough fermentation.

First step is making a broth, using commercial yeasts, yeast foods, and sufficient water to end up with the legal amount of moisture in the baked loaf. Time required for broth fermentation can be varied in accordance with flavor desires and other factors. Recommended period, however, is about 4 hr.

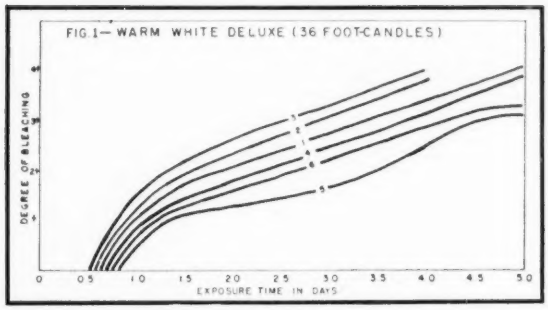
When operating on a continuous basis, successive batches of broth must be started at regular intervals. Properly fermented broth would then be available as needed. And of course the process would then run continuously.

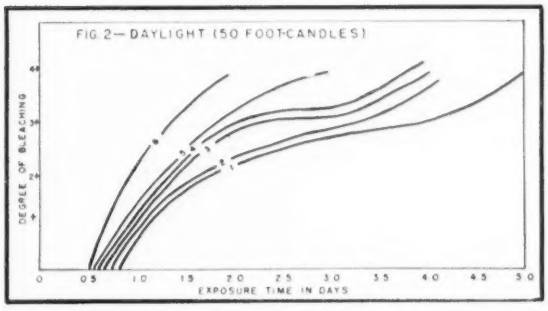
Feeding ingredients into the premixer is next. All other ingredients are automatically fed in a closed system. Flour is handled by W&T's Merchen Feeders. Employed for salt, sugar, and powdered milk is a modification of its standard N-A Feeder.

Shortening and the oxidizing agent

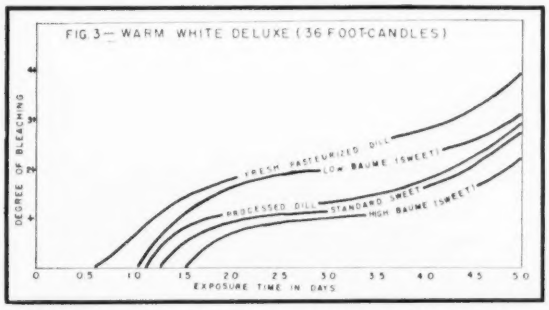
(*Turn to page 183*)

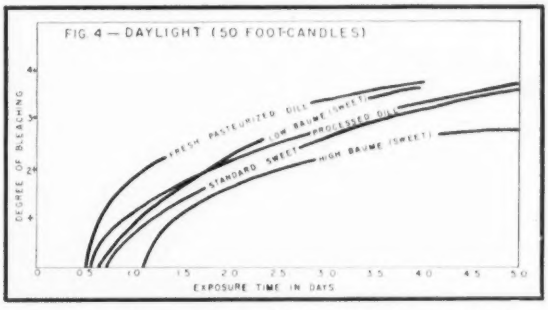
Lamps and the Damage They Do





FIGS. 1 & 2. Bleaching effects of least and most damaging fluorescent lamps on process dill pickles packed in glass jars with brines containing various ingredients. Curve (1): Standard brine (9 gr. acid, 3.8 percent salt, 1:3000 dill oil emulsion). Others: Same brine plus 0.1 percent aluminum sulfate in (2); 0.5 oz. sol. turmeric per 100 gal. in (3); 15 and 25 ppm., respectively, cupric chloride in (4) and (5); and 0.1 percent alum, 0.5 oz. turmeric (6).





FIGS. 3 & 4. Bleaching effects of least and most damaging fluorescent lamps on five different kinds of pickles.

How Store Lights Fade Pickles

They lose their fine natural color when exposed to fluorescents for 36 hr. or more . . . Earliest, greatest damage caused by daylight and standard cool lamps . . . Sugar in brine tends to offset action

F. W. FABIAN and FRANK L. BALDWIN
Michigan Agricultural Experiment Station, East Lansing, Mich.

When jars of pickles are exposed to light from fluorescent lamps, severe bleaching of pickles occurs, regardless of type of lamp or method of preparing product.

Two lamps, however—the daylight and standard cool white—produce the earliest and greatest degree of bleaching. The warm white deluxe lamp produces considerably less bleaching.

These facts are particularly significant when we consider that 99 percent of all supermarkets are lighted with fluorescent lamps.

Little Attention Given

Although undesirable bleaching of pickles during processing is a prime problem commanding much attention from packers, little thought has been given to effects of marketing conditions.

It has long been known that pickles in glass jars bleach when placed in display windows for any length of time. But it is not generally known that bleaching gradually takes place in pickles on shelves of stores employing fluorescent lights.

To determine influence of these lights on color of pickles, a study was undertaken with six different types of fluorescent lights and seven varied pickle packs. Lights used were: Soft white, standard, daylight, warm white deluxe, warm white, and standard cool white—all G. E. 40w., 4 ft. length, regular size lamps.

They were mounted in ordinary fluorescent fixtures each containing two lamps. Tables were placed so that their tops were 5¼ ft. from the lamps—the average distance of the fluorescent lamps from pickle jars in several supermarkets.

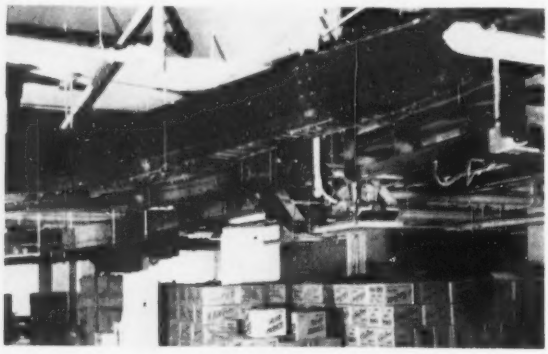
Illumination in foot-candles of each set of lamps was measured with a Weston meter. Lamps were separated by double sheets of brown wrapping hung from the ceiling to the top of the tables, to simulate conditions generally found in retail grocery stores.

Fresh-pack dill pickles used in the experiments were obtained from the Dailey Pickle & Canning Co., Saginaw, Mich. All others were obtained from the H. W. Madison Co., Mason, Mich. The latter were in 60-deg. salometer (16 percent salt) brine. Sizes ranged from 6,000-10,000. For all tests, pint Mason jars were used.

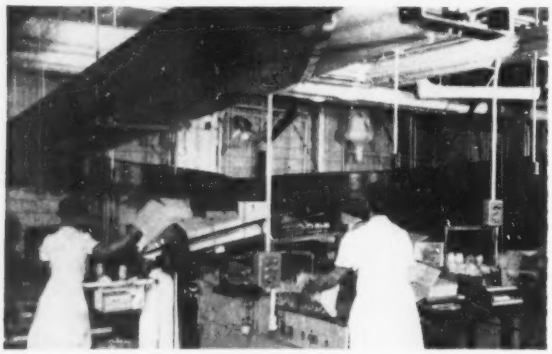
(*Turn to page 169*)

Swift Action: From car—through plant ↓

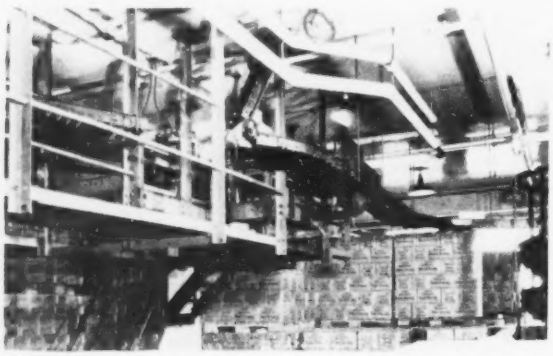
VIA portable roller gravity unit, cartoned empties move from car to inclined belt to 2nd floor filling station.



OVERHEAD belt and gravity system distributes jars to six filling lines. Deflectors route cartons.



JARS go in partitioned filling room, emerge full. Single station allows dual use of carton and inspection.



FILLED cartons go through sealer, printers. Raised bridge (center) is bypass for printed cartons.

"Double-Quicked" Packages

Keep Pace With Fast Process

They're whisked along at Kraft plant by versatile non-stop conveyor system that raises output and reduces breakage

FE STAFF

"When it comes to glass jars—the less man-handling the better."

In a nutshell, this succinct statement guide-posted Kraft Foods Co. planners when they tackled the job of improving the movement of empty and filled containers to and from the plant's ever-growing Miracle Whip operation.

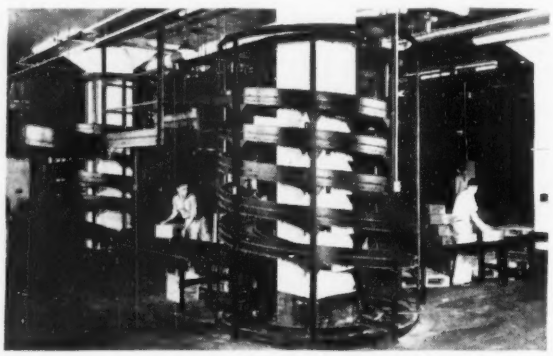
Nimble hands and strong backs could never measure up to the demands. Fillers had to be slowed to match a stately and sometimes erratic container pace. And inevitable breakage marred efficiency and yield.

The answer—hit upon in a close huddle of the Chicago company's engineers with experts from the Lamson Corp.—was a non-stop, process-integrated jar conveying system that keeps the package on-conveyor from the time it arrives on the dock until it is sealed in a finished carton.

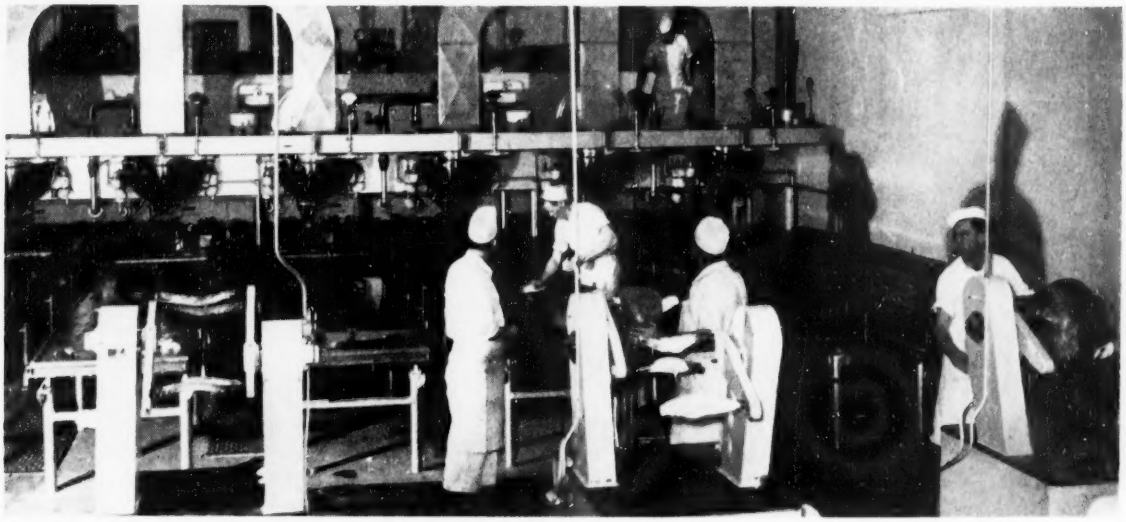
This completely conveyorized installation took some solid designing. For the system of "movers" had to do more than take jars from the freight cars carry them through the entire filling, labeling, and inspection operations, and transfer them on to a finished pallet area. It also had to provide for "surge" conditions so that, for example, incoming jars could be automatically deflected when supply was excessive or a run was completed.

Freight to Filler

To illustrate, let's follow a batch of incoming empties—twelve quart jars per open-top carton—after it arrives by freight car. *(Turn to page 220)*



DOUBLE-TIER roller spiral serves two filling lines, permits two pallet-building stations in small area.



ATTRACTIVE new plant of Seattle candymaker is windowless in its working area. Liquid-sweetener tank trucks have ready access to storage tanks in rear. Parking spaces are at either end of building. Above: View of part of production line. In unitized operation, batches are cooked and dumped from alternating kettles, and candy is cooled and pulled on alternate slabs and pullers, providing constant supply of goods to the cutters.

Streamlining Gets Vernell's

More Output With *Less* Shifts

Twice as much candy now made in single work period as formerly turned out in three . . Mechanizing curbs quality variables as well as costs

RAY BLOOMBERG
FE Correspondent, Seattle, Wash.

Just what are the design prerequisites for a streamlined process?

Sure enough, when you first look at one in operation, its very simplicity seems to imply that designing it was an easy job.

But don't jump too fast to that conclusion—for in truth this is a paradox of skillful engineering.

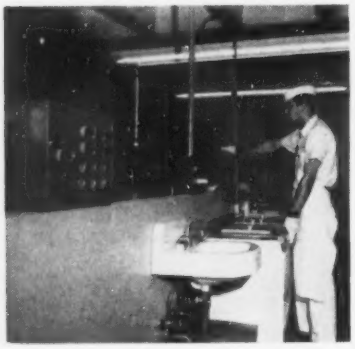
The final design is developed from experience, knowledge, ability, and ingenuity. It is aimed at the basic production problem—that of lowering costs by raising the productivity of men and machines.

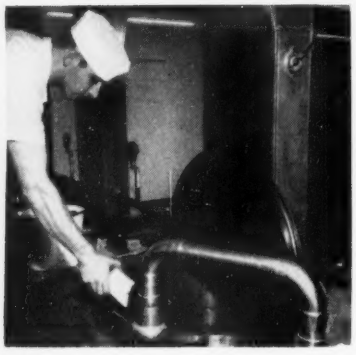
This new $350,000 plant of Vernell's Fine Candies, Inc., at Seattle, Wash., is a pointed example of advanced streamline design. Here, just in a single work shift, the volume of confections brought off the line is now double the production turned out in three shifts at the company's former plant. Capacity up 500%!

And while production has increased,

Process Told in Pictures Next Page→

From Formula . . . to Case ⟶



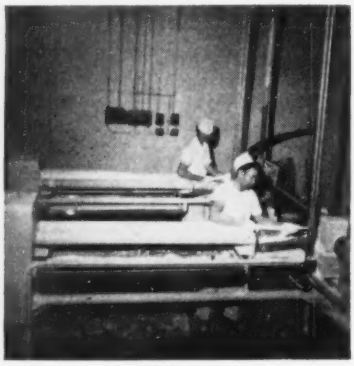


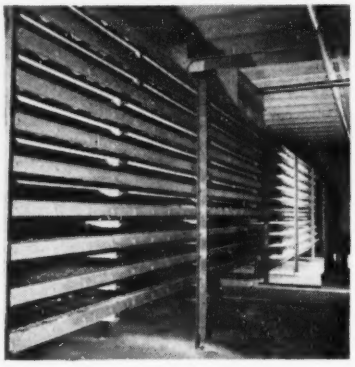
Metering Sweeteners—Adding Butter—Cooking

1 Cook releases valve and preset meter measures . . .

2 . . . blended corn syrup and liquid sugar into kettle.

3 Butter is another ingredient. Note duct that removes steam.





Pulling

7 Then candy goes on unit for pulling, and next is transferred to . . .

Cutting

8 . . . cutters. Then pieces are air-conveyed in tubes to . . .

Second Cooling

9 . . . belts for more cooling, and exits (bottom) into bucket conveyor.

the number of workers has decreased. In addition, the new equipment, some developed by Vernell's, reduces hand work to a minimum and eliminates many of the variables which formerly could affect quality of product.

The company began manufacturing Buttermints in a single copper kettle just five years ago. At the outset, distribution of this candy was limited to the state of Washington due to limited production and a packaging problem. An important ingredient of the confection is butter. The packaging film, used then, did not sufficiently protect the product. The butter would become rancid within a few weeks—a severe handicap to good distribution, storage, and shelf-life.

So a new bag-container was developed. To protect the perishable quality of the product, this item is made of two sheets of laminated 300 MST cellophane. There's only a small window in the bag for display of the product. The remainder is opaque, and here the tradename is rotogravured. Both ends of this bag are heat-sealed and crimped, and it provides a safe container for the mints for at least four months' time.

And Then—Big Demand

"Having surmounted the packaging problem", said President L. H. Fortin of Vernell's, "We were able, during the past three years, to achieve national distribution for our product. And under Vice-President Park Westover, in charge of sales, we now have assumed leadership in the buttermint field, with sales exceeding $2 million annually."

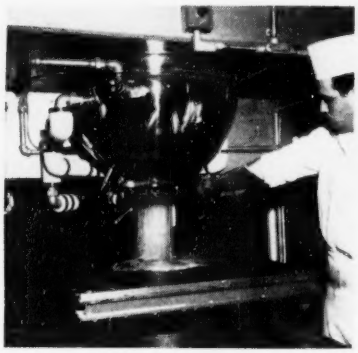
"But", he continued, "having developed large scale distribution, we were then hard-pressed to meet the demand for our product. We simply had to increase production. That meant a new plant. To design and build it, we pooled our experience and processing knowledge with the engineering ability of Ray M. Murray, Jr., Seattle consulting engineer".

Construction began last spring and was completed with equipment installations late in 1952. The plant was on-stream in January 1953.

Liquid sweeteners, corn syrup, and liquid sugar are delivered to the plant by tank trucks. These load directly into storage tanks, located in a room next to the boiler room. The 7,000-gal. liquid sugar tank is refilled daily. The walls of the insulated corn syrup tank contain an electric cable that heats the syrup for efficient handling. Liquid sugar, at 20 gpm., and corn syrup are both pumped to a blender, and the combined sweetener is automatically metered to the kettles.

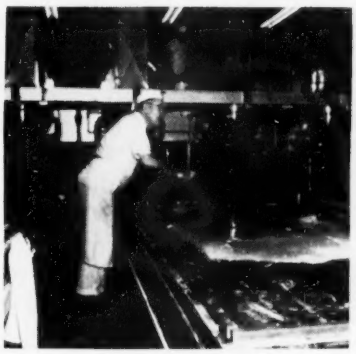
Six kettles are set in line in a raised concrete slab on the cooking balcony, just above the mobile cooling slabs. One cook, working in an efficiently arranged area, tends all six kettles. Automatic controls and refrigerated butter storage are on one side. Kettles are on the other.

Three pipes, conveying liquid sweeteners, are located between each set of



Dumping

4 Batch is dumped on slab. Note drain below, signal lights above.

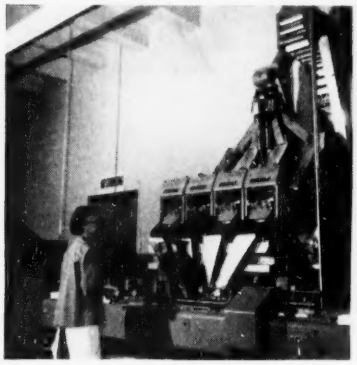


First Cooling

5 With cooling underway, candymaker first turns in edges of batch.

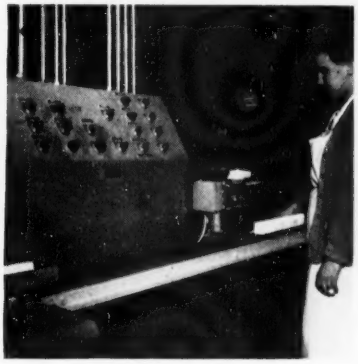
Folding

6 After cooling phase is completed he cuts and folds the batch.



Filling

10 Buckets then dump into hopper serving carton filling machine.



Checkweighing

11 Cartons next are checkweighed. Panel (left) controls line units.

Wrapping and Casing

12 Finally comes wrapping, square-off of bottom fold, and cartoning.

two kettles. These pipes may be swung from one kettle to the other when filling. Flow is regulated by a pre-set meter, the totalizer being set for the number of gallons for each batch.

These stainless steel, jacketed, bottom-draw kettles are heated with 120 psi. steam. Ducts above each kettle connect to two 2,000 cfm. fans on the roof to draw off cooking steam and maintain a relatively low humidity in the room.

Worked From Panels

The cook is in charge of three off-on control panels. One has controls operating the cooling tower pumps, slab pump, syrup line, and air compressor. The other two control the temperature of the kettles.

Red or green lights tell, at a glance, if the switches are on or off. Another set of red-green lights is located directly above the cooling slabs on the front of the balcony. These warn the candymakers, on the floor, that a batch is ready to empty onto a slab. All lights operate automatically.

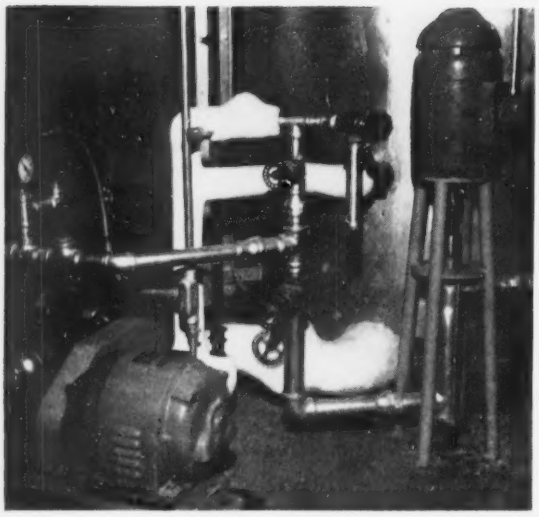
It requires about 18 min. for a batch of ingredients to reach the prescribed temperature—well above boiling. At this point, the steam is automatically shut off and a red light glows to notify the candymaker on the main floor that the kettle is ready to dump. Timing at this point is critical. If left too long in the kettle, the entire batch may have to be discarded.

These bottom-drawn kettles, unique in hard candy manufacture, are unitized in operation with the mobile cooling slabs. They are equipped with spring-loaded Venturi type gate-valves that provide an adjustable flow rate. Controlling the flow of a batch onto the cooling slab reduces the possibility of "graining".

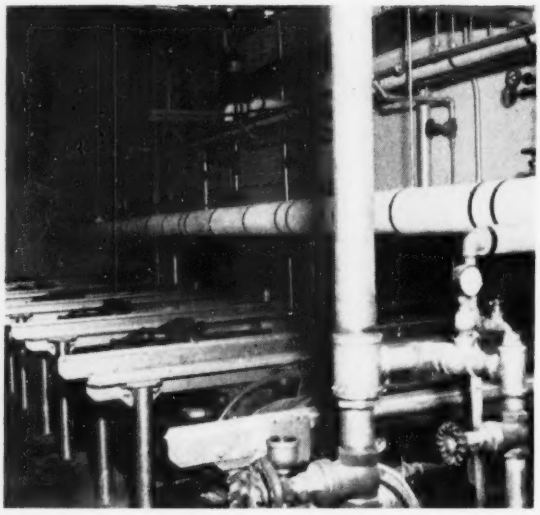
Each cooling slab is mounted on wheels and runs on an elevated track. Length of tracks, which run underneath the balcony, permit the candymaker to position one end of a 4 x 16 ft. steel slab directly under the valve of a kettle. Tracks extend far enough into the room so the slab completely clears the valve after a batch is dumped. Between each track, at the rear, is an automatic reel on which is coiled the hose that supplies cooling water to each slab. Pneumatic rams, also located between each track, provide power to overcome the inertia of the slab when the candymaker starts to move it.

To dump a batch, the candymaker opens the valve and the mixture spreads out thinly on the butter-covered slab. Simultaneously, he trips the pneumatic valve and the air-ram starts the slab in motion on the tracks. He then controls the movement of the slab by hand so the mixture spreads evenly over it as it moves forward under the valve. When the slab reaches the end of the track the kettle is empty and the valve is closed.

The cook then rinses and scrubs the kettle with warm water. Rinse water is released, through the valve, into a



13 **TAILORING** of liquid sugar and corn syrup to Vernell's particular specifications for use in process is carried out in this blending unit developed by the Amalgamated Sugar Co.



14 **ENDS** of cooling-slab tracks in rear of balcony. Hose reels and rams that start movement of slabs are located between each set of tracks. Heavy insulated pipe is steam-header.

drain directly beneath it and leading to the sewer. The kettle is then ready for another batch.

Slabs are cooled by recirculated water which has been precooled over the cooling tower to 15 deg. below tap temperature. As the slab is moved, the hose is unreeled or wound.

Cooling requires approximately 10 min., depending upon atmospheric conditions in the plant. The cooled product, now yellow in color, is then cut in half and each portion folded into a roll. Proper timing at this point is vital. The candy must be folded at the optimum time or it will either stick to the slab or become brittle. In either case, it would be discarded.

Next, the cooled candy is placed on conventional taffy-pullers. These units have 5 hp. variable-speed motors. Changing atmospheric conditions require different speeds. As the candy is worked on the puller, vanilla and oil of peppermint flavorings are added in amounts previously measured by the cook. Normal speed of the puller is 18 rpm. and the candy is pulled for about 4-5 min. During this period its color changes from yellow to a creamy white. Timing here is also important.

Transferred from the puller to a batch roller, the candy is dusted with powdered sugar. It is then tapered by hand to about ½ in. dia. and fed into the automatic cutter.

Especially designed by Vernell's, the cutter produces candy with a rough, home-made appearing cut. Each circular cutter has 12 steel blades (2½ in. long x ⅛ in. thick) revolving at 230 rpm. Candy falls into a hopper and is conveyed by pneumatic tubes to the cooling conveyor.

The cooling-drying room is air-conditioned. Temperature is maintained at 68 deg. F. and humidity at 70 percent. The "live belt" of the cooling conveyor is arranged in ten staggered levels, each measuring 75 ft. in length, plus a 50-ft. eleventh level at bottom.

It is 30 in. wide, levels are spaced 6 in. apart. Candy is evenly distributed on the top belt from the pneumatic tube conveyor and falls from one level to another until it drops from the lower belt into a stainless bucket conveyor. The full trip on this belt requires 89 min.

Constant Air Changes

Air in this room is changed every 3-4 min. It enters through two vents at the top and discharges in ducts near the floor. Before it is recirculated it passes through a dust-collector, where filters remove air-borne powdered sugar picked up in the room. The air-conditioning unit is operated by a 15 hp. motor. Air may be washed, cooled, or heated in this unit, as desired.

From the cooling conveyor, the bucket elevator first moves in a duct across the floor. It exits from this room through a port, high on the wall, into the packaging department.

At this point the candy is plastic. Storage of any substantial amount for a length of time causes the candy to "freeze" together—so less than 2 sec. of product supply is stored in the carton filling unit.

The candy drops from the bucket conveyor into a compartmented hopper, from which it empties into four chutes feeding the net-weight scales of the filling unit. It is in the four compartments of this hopper where the brief 2 sec. supply of candy is temporarily stored.

A mercoid switch automatically operates the exit gates of these four compartments. When a sufficient supply of candy accumulates in the four chutes feeding the scales, the switch actuates the gates and the flow is diverted back into the air-conditioned cooling room. Here, it again joins the main flow in the bucket conveyor and is recirculated to the filling unit.

The feeds to the net-weight scales have two sections—bulk and dribble. Both deliver up to 6¼ oz. of product into the scale. Then the vibrator feed on the bulk chute automatically shuts off and the candy continues to dribble onto the scale until a net weight of 7 oz. is reached.

The candy is then released from the four scales into chutes, which fill four open-topped cardboard cartons at a time. Unit fills 60 cartons per min.

Filled cartons then move by conveyor through the wrapping machine. This unit heat-seals the side seam and crimps and heat-seals both ends. Wrapped product then moves on a transverse finger-link chain across another filling-heating type unit that squares off the bottom crimp against an end-seal shoe heated to 450 deg. F.

Completed packages are packed twelve to a display carton. Shipping cases contain two display cartons.

FOOD ENGINEERING'S

INGREDIENT SPECIAL

10 FEATURE ARTICLES

TO HELP YOU IMPROVE QUALITY

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IFT SPECIAL ISSUE—Including Score of Ingredient Exhibits . . . 111

A Special Section of FOOD ENGINEERING, June, 1953

LEAVENING properties of prepared baking mixes are scientifically evaluated in this modern baking laboratory.

The Growing Role of Phosphates

They Offer *More* Than Enrichment

—as buffers they prevent curdling of evaporated milk, maintain optimum pH in fermentation processes. As acidifying agents they impart tart taste to drinks, and furnish acidity to produce reactions. Many other uses cited

R. A. BARACKMAN and R. N. BELL
Research Laboratories, Victor Chemical Works, Chicago Heights, Ill.

Phosphoric acid combines with a number of elements to form salts and esters that supply phosphorus which is assimilable in the human body.

Some of these compounds are used exclusively for this nutritive value. Others are capable of performing functions which are entirely distinct from their value as foods.

These compounds can be grouped according to the function they perform, either in the food, or in its processing, although many times they impart more than one effect. In general these are the functions:

1. **As enrichment in foods**
2. **To control pH or produce buffering action**
3. **As acidifying agents, and**
4. **As emulsifying, coagulating, or peptizing agents.**

In a sense, whenever a phosphate is added to a food it imparts a measure of enrichment, since it adds an essential element to the diet.

Presence of added phosphates in the American diet is indicated in the accompanying table, which presents the major phosphorus-containing compounds that are currently used in foods and food processing.

Enrichment of Foods

Cereal products enriched with calcium in the form of mono-, di-, and tricalcium phosphate have gone a long way toward overcoming the well-known calcium deficiency in the American diet.

Iron is also a required enrichment ingredient along with certain vitamins. Iron ortho- or pyrophosphates are used in enrichment wafers in the manufacture of bread. And sodium iron pyrophosphate, which does not promote oxidative rancidity of fats, is an additive to family flour, corn meal, and other products where shelf life must be considered.

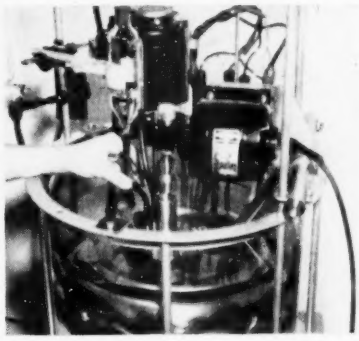
Calcium and iron phosphates are also added in enrichment quantities to breakfast cereals, chocolate drink preparations, baby foods, and dog foods.

Control of pH is essential in many food processing operations. Large amounts of phosphoric acid are used to buffer nutrient solutions to the optimum pH in preparation of yeast as

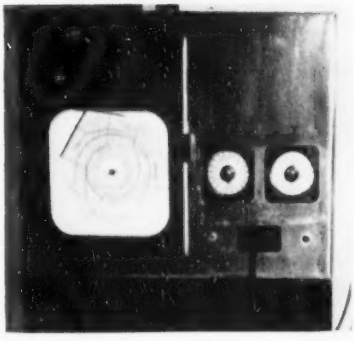
How Activity of Leavening Agents is Determined

1 Dry mix is put in bowl.

2 Gas-tight lid is applied.



3 With bowl in water bath, liquid is added to form dough.



4 Gas evolved during controlled mixing is recorded.

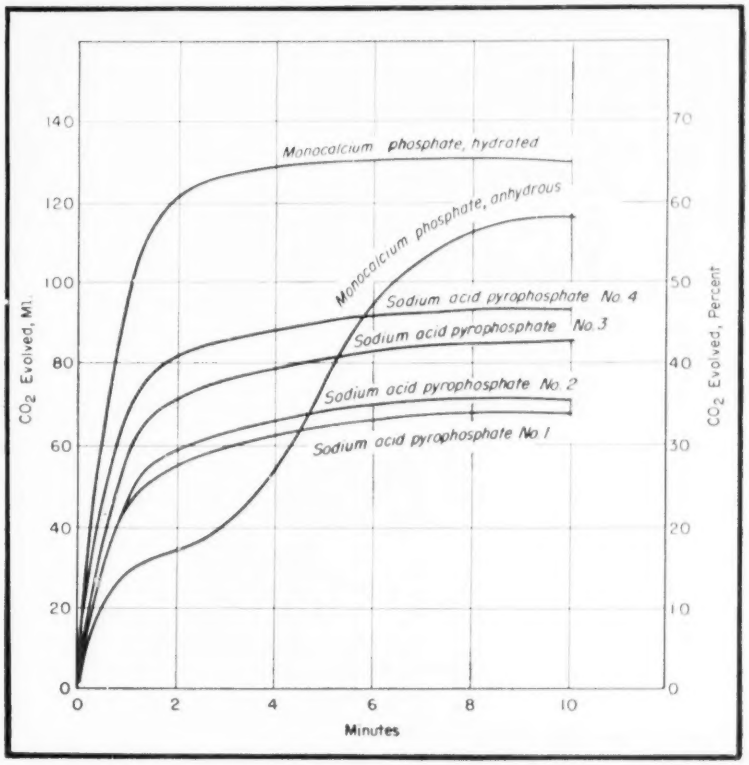
well as in fermentation processes which involve enzymatic reactions. In these processes, phosphorus essential to growth of the microorganisms involved is supplied, too. Control of pH can also be used to inhibit growth of certain organisms, as in the case of rope infection in bread, which is controlled by including a small amount of monocalcium phosphate in the formula. When pH of bread is lowered to 5.0–5.2, rope does not develop.

FDA Standards recognize addition of up to 0.1 percent disodium phosphate to evaporated milk, where it exhibits a different type of buffering action. Ratio of calcium and magnesium to phosphate and citrate in milk may vary from time to time, causing it to be highly heat sensitive. Disodium phosphate is added to maintain a favorable balance so that evaporation or sterilization can be effected without curdling.

Buffering action of this product is also used to attain and maintain optimum pH of 7.0 when farina is cooked. This not only improves the product, in that the particles swell faster thus allowing a shorter cooking period, but the porridge is more thoroughly cooked and is therefore more readily digestible. A similar application is in macaroni products where FDA recognizes disodium phosphate as an optional ingredient in amounts not less than 0.5 nor more than 1 percent. Amounts up to 0.5 percent are allowed in the preparation of plum pudding for the Armed Forces.

Disodium phosphate is also used in preparation of certain precooked meat products. Its addition to pumping and covering pickle solutions reduces loss of nutrients from hams during the cooking process. Thus shrinkage is minimized and the traditional flavor of the product is retained. It also helps prevent discoloration after the hams are cooked.

Acidifying agents are added to foods for two reasons, either to impart a tart taste to the finished product or to furnish acidity to bring about a desired reaction. Examples of both of these uses are familiar to everyone.



5 AND rates of reaction obtained by plotting gas against time. Graphs above are for a doughnut dough system mixed 1 min.

Phosphoric acid—which, in very low concentrations, is the acidifying agent in soft drinks—imparts tang, enhancing the drink's flavor. The public has registered its approval of this flavor in no uncertain fashion. Powdered concentrates for making cold drinks at home consist of sugar, flavor, and a solid acid, such as monocalcium phosphate. Latter yields the tart flavor desired when the powder is dissolved in water, yet is substantially inert in the package. It does not cause inversion of the sugar nor gumming in the envelope.

In pectin jellies (imitation) phosphoric acid has proved of great value. It furnishes the proper acidity to attain optimum gel strength and at the same time imparts a desirable tart taste, both of which are retained when the jelly is used in baking products. In this way jelly can be prepared from natural fruit juices in which the normal acid content is too low to effect gelling. Such jellies, however, must be labeled "imitation."

Acid inversion of sugar for fondant

Ingredient Special

and icings can be carried out using a highly acid phosphatic salt. When sugar, water, and phosphoric acid are boiled, attainment of 100 percent inversion is very rapid and caramelization, even to charring, takes place. Use of the acid salt, in place of phosphoric acid, results in a slow inversion without caramelization. Thus, both acidifying and buffering effects are utilized.

Leavening agents play an important role in modern living. Even yeast, which was the first leavener, now needs assistance in meeting the demands of present mechanical processes of dough preparation. This is accomplished through use of bread improvers or yeast foods in which nitrogen, calcium, and phosphorus are supplied by the use of calcium and ammonium phosphates.

Baking powder is a common example of a functional use of acid phosphates. These furnish the acid that reacts with bicarbonate of soda to liberate carbon dioxide which aerates the baking product. The residual phosphate from the reaction buffers the baked product within a pH range which is palatable, and the residual salts have certain emulsifying and coagulating properties which are recognizable, either in the dough during baking, or in the baked product.

Baking powders, which have largely supplanted yeast in the leavening of quick breads, cakes, and doughnuts, have a definite function to perform and must be designed for the specific product being manufactured. This is particularly true in the case of prepared baking mixes now on the market, where the leavening ingredients must be tailored to the particular product in which they are used.

Acid phosphates react with sodium bicarbonate at a variety of rates. Ordinary monocalcium phosphate, having one water of crystallization, is very rapid in reaction so that a large portion of the gas released is lost from the dough or batter. This product is frequently used in conjunction with one of the more slowly reactive baking acids, such as sodium acid pyrophosphate or sodium aluminum sulfate.

Coated anhydrous calcium acid phosphate has a delayed reaction with bicarbonate, thus enabling retention of more gas during dough preparation. This delayed action is desirable in baking powders for home usage, in self-rising flour, in self-rising corn meal, and in ready-mixed cake flour preparations. It has also found use in the baking of angel food cakes.

Control In Manufacture

Sodium acid pyrophosphate is a baking acid which can be regulated in its reactivity rate by modifications in the method of manufacture. A product ranging from 20 to 45 percent reactivity in the cold dough can be prepared. Sensitivity to oven heat can also be regulated by the method of manufacture. Most phosphate manufacturers offer a service to the customer whereby his product is studied and the correct rate level recommended.

Control of acid phosphates during manufacture is accomplished by measuring their rate of reactivity with bicarbonate in doughs.* The accompanying Figs. 1-4 show the equipment used for control and, even more important, for research on gas evalution of chemical leavening agents in doughs or batters. Fig. 5 shows rate of reaction curves for typical acid phosphates with sodium bicarbonate.

Sodium phosphates, when used in process cheese, are usually referred to as emulsifiers. In the United States, where relatively young cheeses are selected for blending and processing, disodium phosphate is used, whereas in Europe, old cheese is used which requires the more powerful emulsifying action of the pyro- and metaphosphates.

Use of disodium phosphate as a buffer in evaporated milk has already been indicated. In addition to the buffering action, this phosphate produces a pronounced swelling of protein so that a smooth, easily dispersed milk product is maintained over extended storage periods. Another phosphate used in dairy products is tetrasodium pyrophosphate, which when added to chocolate drink powders improves their rate of wetting and gives the prepared drink a richer color and flavor.

An interesting reaction is being used currently to replace the coagulating action of rennin on milk protein. Instant puddings now contain tetrasodium pyrophosphate which, it is claimed, acts both as a protein coagulating agent and as a wetting agent. A calcium salt is also added to provide calcium ions, which aid in stabilization of the gel structure.

Extraction processes involving pectinous fruits and vegetables have been improved by the use of sodium phosphates. Thus, yield of juice from tomatoes and viscosity of the finished juice is improved by use of polyphosphates. Viscosity of tomato sauces, thickened with polyphosphates, can be further improved by use of calcium salts.

Tomatoes can be canned and cooked with less disintegration if a firming agent such as a calcium salt is used. Here, economy dictates a less expensive salt than calcium phosphate. It has found use, however, in the firming of canned and frozen apple slices. For home jelly making, pyrophosphates and polyphosphates improve the extraction of pectic substances and also the setting of the gel so that a higher sugar-to-fruit ratio can be used.

An interesting application of hexametaphosphate is its coagulating action on albumen when angel food cake batters are being prepared. This effect is particularly advantageous in some of the dry new mixes.

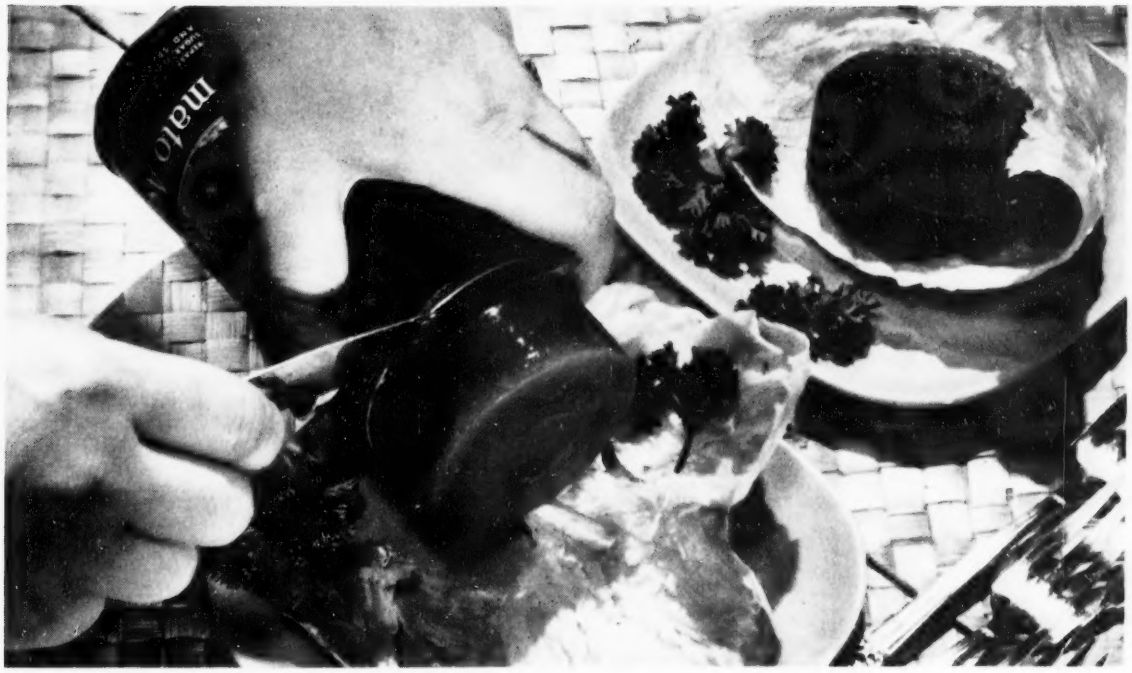
An example of the mechanical action of phosphates is found in tricalcium phosphate which, because of its enormous surface area and strong adsorptive properties, is used to maintain such materials as salt and bicarbonate of soda in a free-flowing condition. This is useful not only to

(*Turn to page 108*)

PHOSPHATES
Find Many Uses
In the Food Field

Products	Baking Powder	Self-Rising, Pancake, Flour	Prepared Flour Mixes	Phosphated Flour	Farina	Yeast and Bread	Nutrient Solutions	Cookies, Crackers	Evaporated Milk	Process Cheeses	Meat Processing	Salt	Sugar, Sugar Inversion	Soft Drinks	Enrichment	Jellies	Chocolate, Malted Powers	Instant Pudding	Water Treatment
Phosphoric acid	..	..	..	..	..	●	..	..	..	..	..	..	●	●	..	●	..	..	..
Hemi-sodium phosphate	..	..	..	..	..	..	..	..	..	..	..	..	●	..	..	●	..	..	..
Monosodium phosphate	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Disodium phosphate	..	..	..	●	..	..	..	..	●	●	●	..	..	..	..	..	●	..	●
Trisodium phosphate	..	..	..	..	..	..	..	..	..	●	..	..	..	..	..	..	..	..	●
Sodium acid pyrophosphate	●	●	●	..	..	..	..	..	..	●	..	..	..	..	..	..	..	..	●
Tetrasodium pyrophosphate	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	●	●	●
Sodium tripolyphosphate	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	●
Sodium hexametaphosphate	..	..	●	..	..	..	..	..	..	●	..	..	..	..	..	..	..	..	●
Monocalcium phosphate	●	●	●	●	..	●	..	●	..	..	..	..	●	..	●	..	..	..	..
Dicalcium phosphate	..	..	..	..	..	●	..	..	..	..	..	..	..	..	●	..	●	..	..
Tricalcium phosphate	..	..	..	..	..	●	..	..	..	..	..	●	●	..	●	..	●	..	..
Monoammonium phosphate	..	..	..	..	..	●	●	..	..	..	..	..	..	..	..	..	..	..	..
Diammonium phosphate	..	..	..	..	..	●	●	●	..	..	..	..	..	..	..	..	..	..	..
Ferric orthophosphate	..	..	..	..	●	..	..	..	..	..	..	..	..	..	●	..	..	..	..
Ferric pyrophosphate	..	..	..	..	..	..	..	..	..	..	..	..	..	..	●	..	..	..	..
Sodium ferric pyrophosphate	..	..	..	..	●	..	..	..	..	..	..	..	..	..	●	..	●	..	..
Potassium phosphates	..	..	..	..	..	..	●	..	..	..	..	..	..	..	..	..	..	..	●

* *Cereal Chemistry*, 8, 423, 1931



BY GELLING without sugar, a new pectin makes possible attractive products like this ready-to-serve tomato aspic.

BETTER PECTINS

They Improve Many Processed Foods

Low methoxyl pectins give gels of fruit and vegetables without sugar, fruits for ice cream with low sugar, salads and dressings from fruit and vegetable juices. Regular products aid bottlers, preservers, confectioners

GLENN H. JOSEPH
Sunkist Growers, Research Department, Corona, Calif.

Two forms of pectic substances are important to food processors:

1. Those already present in fruits, berries, and vegetables, and

2. Those added to fruits and berries to compensate for natural deficiencies, or to improve a wide variety of prepared foods.

Processors sometimes overlook the importance of knowing the properties and functions of the pectic substances naturally present in foodstuffs. They thereby fail to utilize to the fullest extent the virtues of these interesting and commercially important colloidal substances.

For example, tomato purees and pastes owe their desirable viscosities to pectin in cell walls. And the firm, crisp character of cucumber pickles is due to pectin in the cell structures.

However, enzymes capable of destroying the pectic molecule are always present in plant tissues. As fruits and berries ripen, the pectic substances responsible for holding them firm and drawing vital plant substance fluids to them are broken down (by pectic enzymes) to simpler compounds, enabling them to soften.

These same pectic enzymes are released from cells of tomatoes during crushing and, unless quickly inactivated, cause viscosities of pastes and purees to fall to levels that are undesirable.

A somewhat similar condition exists in the case of citrus juices. Here, an undesirable gelation of natural pectin in the concentrated juice is avoided by inactivating enzymes in the juice before concentrating.

In the case of pickles, if brines become contaminated with pectic enzymes soft and flabby pickles will result.

On the other hand, food processors sometimes find it desirable to destroy the natural pectic substances in order to obtain special characteristics in the final food. A good example is in preparation of sparkling clear apple cider, not possible except by deliberate enzymic destruction of the natural pectin of the juice before filtration.

Physical Characteristics

Dry pectins retain their gel-forming properties over long periods of time when stored in a reasonably dry atmosphere at room temperatures. Cold storage of the dry products further prolongs their useful life. When pectin solutions are prepared, they must be protected against mold contamination because molds usually produce enzymes which quickly destroy the solution's usefulness.

Pectins have their greatest stability

Ingredient Special

in the pH range of 2.0-4.5. Greater acidities than pH 2.0, especially when heat is applied, accelerate degradation, while at pH levels of 5.0 and higher heat very quickly converts pectin to a pectate where the usual type of gel formation with sugar is no longer possible. Acidity of most commercial pectins is adjusted so that a 1 percent solution has a pH of 3.5-4.2.

Individual particles of the dry, powdered pectins ordinarily used by food processors are completely and quickly soluble in hot or cold water and fruit juices. However, when many such particles are added at one time all do not dissolve instantly. Some of the incompletely hydrated, swollen particles adhere to adjacent ones and usually entrap the less completely hydrated ones. The clump thus formed contains an undissolved core which is protected from the solvent by a slowly soluble, gummy outercoat. This behavior is also common with the gums and marine colloids.

The clumping tendency is easily overcome when some dry, readily soluble substance like sugar is mixed with the pectin to serve as a spacer. Usually three to five times as much sugar as pectin is used.

Liquid spacing agents such as glucose or sucrose syrup, glycerol, honey, or even alcohol, may be used to make a slurry so that when water is added, with stirring, the pectin goes into solution without clumping. When it is desirable to dissolve pectin without the aid of any depersing agent, it can be done by sifting the product slowly into the vortex caused by high speed agitation of the liquid.

Since sugar concentrations above 40-50 percent tend to gel pectin solutions, maximum benefits will result when pectin is dissolved in water or fruit juices to which no sugar has been added. Later the sugar can be added to any desired level.

Facts About Pectin Gels

Rate of gel* formation depends upon many factors, such as type and amount of pectin, pH, sugar concentration, and temperature. When using a fixed amount of any one pectin the rate of gel formation becomes more rapid the lower the pH and temperature and the higher the sugar concentration.

A solution containing 0.3 to 0.5 percent pectin will not gel when chilled, yet when sugar is present to 60-65 percent of total weight and pH is adjusted to 2.0-3.5, a gel forms very quickly, sometimes at temperatures near the boiling point when rapid setting pectins are used. Solutions of 1-2 percent gelatin, on the other hand, form gels merely by chilling but revert to solution form when the temperature is raised to 80-85 deg. F.

Commercial preservers sometimes fail to realize the tremendous effect pH has upon pectin gel formation. Even though sugar and pectin are present in correct amounts, no gel will form until acidity has been lowered below a limiting pH which is near 3.6. A shift of 0.02-0.05 in the range of 3.3-3.5 can sometimes make the difference between success or failure for a jelly maker. Fruit jellies of pH 3.3-3.5 require several weeks to reach maximum firmness.

Low Methoxyl Pectin

A new type product, known as low ester, low methoxyl, or Pectin L.M., has become of increasing importance to food processors during the past few years. This type product which usually has a methoxyl content of 4.0-5.0 percent (moisture and ash free basis), has the remarkable ability of forming gels without regard for sugar concentration. However, divalent metal ions such as calcium are needed to tie the pectin chains together.

Usually 0.7-1.5 percent (based on final gel weight) of this type of pectin is required for normally firm gels. Vegetable or fruit juices usually contain about half the amount of calcium required for good gels. In such cases, it is necessary to add about 0.10 percent (final gel weight) of crystalline calcium chloride. Milk furnishes sufficient calcium so that custard and pudding gels need no added salts.

Pectin L.M. makes good gels, using dried or fresh milk at pH 6.5, while with fruit or vegetable juices the pH should be 3.2-4.0. Calcium requirement is associated with pH. For instance, a tomato aspic might require 1.5 oz. calcium chloride per pound of pectin at pH 3.6, while at pH 3.8-3.9, the requirement might go up to 2.0 oz.

It is highly desirable to prepare small scale batches with varying calcium and pectin additions to determine optimum proportions for the particular type of gel desired. Suppliers of low methoxyl pectin usually make available typical recipes and operating procedures to aid the food processor.

Important point to remember is that the pectin should be dissolved completely in water or juice before addition of the calcium salt. Latter is incorporated in the hot gel batch just

* The word *gel* is a general term. *Jelly* is reserved for the common table jelly for which definitions and standards have been given by FDA.

Some Food Uses for Pectins

Type	Typical Uses	Approximate Amount In Final Product,[1] Percent	Important Factors
Regular pectin (150 grade)	Fruit jellies, jams, preserves, also bakers, jellies	0.1–0.8	Soluble solids for jellies 65 percent, jams, 68. pH 2.8–3.2
	Confectionery jelly pieces	0.85–1.25	Soluble solids 80–82 percent, buffer salt needed. pH (50–50 mixture jelly, water) 3.4–3.7. Equal weights glucose and sucrose
	Home jelly making mixtures	Usually 3 oz. 7 to 6–8 glasses	Mixtures of dextrose, pectin, fruit acid, about 10 grade
	Thickeners for low-calorie fruit syrups and beverages	Few tenths	Care needed in preparing solution when sugar is not included as spacing agent
	Flavor emulsions, salad dressings	2–3 of water phase	Best for oil contents 15–20 percent and higher
	Cream whipping aids, bakers, glazes, malted milk thickeners		These and other specialty uses require specific instructions[2]
	Salad and dressing gels a. Imitation flavor and color (for home consumption)	0.8–1.5	Ca $(H_2PO_4)_2 \cdot 2\ H_2O$, 8–16 percent weight of pectin. Sometimes sodium citrate and fruit acid are added
	b. Fruit and vegetable juices (canned gels)	1.0–1.8	$CaCl_2 \cdot 2\ H_2O$, 6–14 percent weight of pectin. pH 3.6–3.8. Pectin in solution before adding calcium salt
Low methoxyl pectin (Pectin L.M.)	Milk gels and puddings	0.8–1.5	No calcium salt needed
	Low-calorie, jam-like fruit gels for dietetic use	0.8–1.5	Need proper balance of pectin and calcium. Small amounts sorbitol and glycerol desirable
	Frozen strawberries	0.1–0.15 berry wt.	Most effective when in sugar syrup added to packed berries
	Fruit and berry gels for use in ice cream	0.8–1.5	40–50 percent sugar. Fruit acid, sometimes calcium salt

[1] Percent pectin is not always as important as technique used.
[2] Manufacturers can supply important details.

before it is poured into final containers. Calcium salt should be dissolved in a small portion of hot juice so that there will be no local chilling or over-concentration of calcium ions to cause premature gelation. This corresponds to the practice, in regular jelly and jam production, of adding the setting acid at end of cooking operation.

A most important characteristic of low methoxyl pectin gels is their ability to set properly and to maintain their gel form at temperatures considerably above normal room conditions. In tomato aspics, for example, gel formation will usually start at 170 deg. F. and the products will be suitable for table use even at 110-120 deg. F. This contrasts sharply with gelatin desserts which gel very slowly and only when the temperature is below about 80 deg. F.

This type of pectin is ideal for fruit puree gels (at 40-45 percent sugar) for use in ice cream, where regular pectin jellies require so much sugar that freezing temperatures are depressed and bleeding is difficult to control. Also, for preparing gels for salads and dressings, and dietetic fruit gels made without added sugar.

Confectionery Uses

Special slow-setting pectins have found widespread usage in the confectionery industry for preparing slab or starch cast gels of excellent texture, flavor, and keeping quality. Usually only 2.5-3.0 lb. of 150-grade confectioners pectin, with 100 lb. each of granulated sugar and 43 Bé. glucose will make more than 200 lb. of candy. An easily available and inexpensive buffer salt (sodium citrate or acetate) and some fruit acid (citric or tartaric) are needed. Pectin manufacturers furnish easily followed recipes for making these candies so that a variety of pieces can be made.

When proper balance between sucrose and glucose syrup is used and cooking techniques are as recommended, final pectin pieces will stay fresh and tender for many months without weeping or crystallization.

No storage in expensive drying rooms is necessary with these candy gels because it is possible to cook directly to 80-83 percent soluble solids, cast in desired shapes and, after a suitable cooling period, sand or chololate enrobe and pack.

Best pH for most pectin candy gels (tested in a solution of the gel in an equal weight of water) is 3.5. It is possible, at this desirable acidity, to get pieces with a true fruit flavor.

Cell structure of strawberries and other berries is disrupted to a certain extent during freezing, so that, when the berries are thawed, more than a normal amount of juice can drain off and the berries themselves have a shrunken appearance.

When berries in consumer packages are frozen with a sugar syrup containing a trace of low methoxyl pectin, calcium from the berry juice reacts with the pectin to form a calcium pectinate film or barrier at each capillary opening on the berries. This provides an invisible seal at points where juice seepage could occur. This phenomenon is particularly evident in the case of sliced strawberries frozen in syrup.

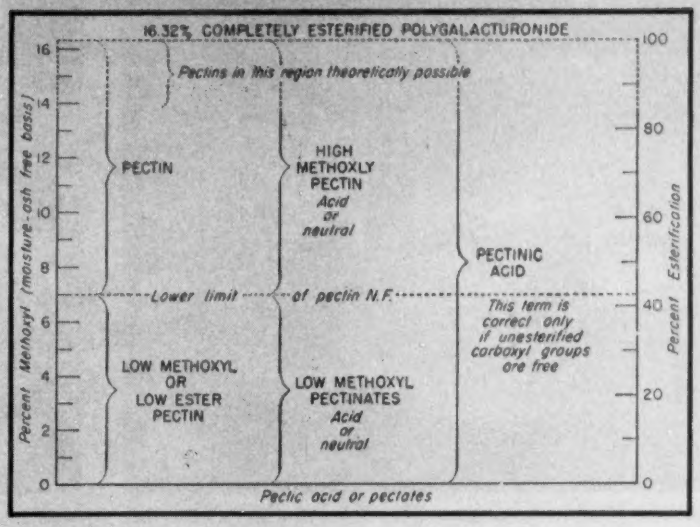
Many years ago the use of regular pectin for such purposes was advocated. However, it does not react with calcium, and functions only by increasing viscosity of the sugar-juice mixture. Pectin L.M. gives a beneficial action when present at 0.10-0.15 percent of the weight of the berries—a level too low to give objectionable gel clumps or a noticeably increased viscosity in the drained juice. When used with dry sugar in the freezing of berries, beneficial action is less apparent because the pectin is only slowly and incompletely dissolved in the presence of the cold berry juices containing calcium.

This application of Pectin L.M. has not been studied sufficiently on a commercial scale to enable FDA to include it among permitted additives. However, a recent and very extensive experimental study of the problem was reported from the Food Processing section of TVA.* Whole and sliced Tennessee Supreme strawberries were treated before freezing with various

(*Turn to page 114*)

* Wegener, Baer, and Rodgers, *Food Technology*, 5, 76-8, 1951.

What, Where, and Why

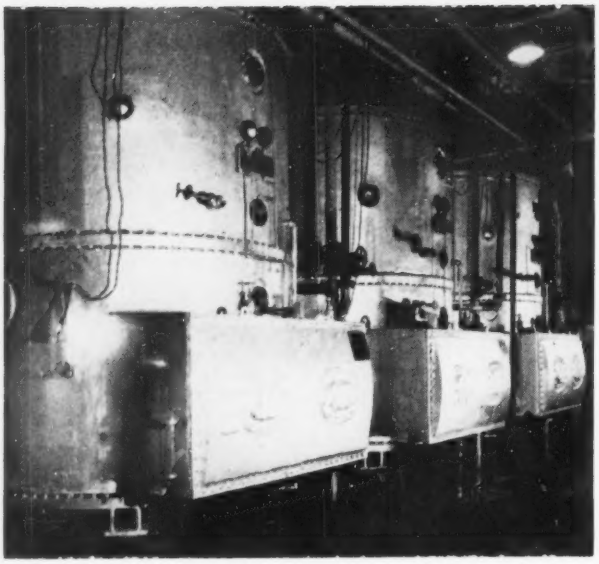


Proper term for those pectinates capable of forming the well-known fruit jellies when sugar and acid are present in correct proportions—is pectin. This is according to the ACS nomenclature of 1944 (see accompanying chart) which describes it as having a methoxyl content higher than 7 percent.

Pectins are carbohydrate-like substances made up of long chains of galacturonide units in a manner similar to the way starches and celluloses are built up from glucose units.

Molecular complexity of pectin can be easily understood when one realizes that these groups may consist of a thousand galacturonic acid units. Some carry methyl ester groups; other acid groups are free. Further, the chains may be cross-linked by electrostatic forces to build up bundles of varying thickness and width.

Nature has made it evident that pectin substances are expected to be a part of the human diet. Pectic enzymes of bacterial origin, always present in the human colon, carry on the job of digesting the pectin which enters man's alimentary tract as a natural part of our diet and also that which is used as an additive in prepared foods. Gums which arise from bark wounds on desert trees and bushes, also marine colloids, are not so easily taken care of in the human digestive tract.



CORN SYRUP is concentrated in triple-effect pan (left), then cooled by dropping into coil tank (right).

CORN SWEETENERS

Help Processors in Many Ways

Their resistance to heat discoloration improves appearance of preserves and candies . . . Cohesive properties prevent stickiness in cereals . . . Body building characteristics make better ice cream

R. F. COHEE, Jr.
Corn Products Sales Co., Chicago

Dextrose and corn syrups, when used in varying proportions with other sugars, have proved to be highly satisfactory for sweetening and compounding many food products.

In canning, ingredient costs are lowered, fruit flavors and physical appearances are improved, color is better retained.

Preserves made with corn sweeteners are more acceptable because of reduced sweetness and lessened tendency toward crystallization.

In ice cream and other frozen products quality is improved when sweeteners are comprised of mixtures of corn syrup or dextrose with other sugars.

And in the confectionery and baking industries, these sweeteners find large numbers of uses. These and other uses are listed in Table I.

Ingredient Special

There are three commercial classifications of corn syrups which vary according to their dextrose equivalent (D.E.), or total reducing sugar content as dextrose on the dry basis. These are: Low (D.E. 28-33); regular (D.E. 40-45), and high conversion (D.E. 52-63), either straight acid or acid-enzyme catalyzed. Another term sometimes used in the trade is C.S.U. meaning "corn syrup unmixed."

Corn syrup solids, except for moisture content, have the same composition as corn syrup in the liquid form.

Properties of finished syrups are determined by degree of hydrolysis of the pure starch from which they are made.

In commercial practice the starch is made into a slurry with water, acid is added, and the entire mass is cooked under pressure for several minutes to accomplish the conversion. Dilute syrup from the converter is neutralized to desired pH and refined to remove undesirable colored materials.

The light syrup is next concentrated in vacuum pans to an appropriate dry substance level of approximately 31.5 Be. Refining with various decolorizing agents followed by filtration is applied before the syrup goes to the finishing pans, where it is generally evaporated to 43 Bé.

Dextrose sugar is produced in a manner similar to corn syrup but higher conversion practices are followed. Concentrated sugar liquor from the finishing pan is pumped into large cylindrical crystallizers. Here, over a period of several days, crystals grow to a satisfactory size for standard purging.

The mass is then dropped into centrifuges, where mother liquor is removed and wash water is applied. The damp white sugar from the centrifuges may be dried and packed by conventional means or subjected to further processing that results in anhydrous or other modifications.

Dextrose is a monosaccharide ($C_6H_{12}O_6$) produced by complete hydrolysis of starch. It comes in two principal commercial types: Hydrate

(8.8 percent moisture) and anhydrous (less than 0.2 percent moisture). Various particle sizes are available if needed.

Properties, Uses of Corn Syrup

Chemical properties of corn syrup may be varied somewhat, depending upon the kind and severeness of hydrolysis during manufacture (see Table II). Buffering action, a highly important function of corn syrup when used with high concentrations of sucrose, is somewhat dependent upon the method of purification. For example, an ion exchange syrup will not be as highly buffered as a bone-black refined product. Note, too, that the ash content of the syrups varies widely with the type of refining.

One of the most important characteristics of corn syrup is its resistance to formation of heat-catalyzed color precursors. Under acid conditions as most foods are produced, dextrose and corn syrups have less tendency to discolor and turn brown than sucrose or syrups made therefrom. This is because hydroxy-methyl-furfural and levulinic acid are more easily produced from levulose, the product always present when sucrose occurs under acid conditions.

Resistance of corn syrup to heat discoloration has been well known to candymakers for many years.

One of the important physical factors a processor must remember is the effect of solids and temperature upon viscosity of corn syrup (see Table III).

The glass-like consistency of hard candy is due in part to viscosity of the corn syrup portion and in part to its tendency to prevent crystallization at high solids content.

Next, one should consider the solubility of corn syrup. For the chewing gum trade, the syrup is furnished at 45 Bé (approximately 85 percent solids). Compare this to the upper limits of solids shipable in liquid sugar of approximately 65 percent sucrose.

As to hygroscopicity, the higher the D.E. of the syrup the greater the tendency to take up water. For this reason, a regular C.S.U. is preferable to a high D.E. product in hard candies, since less stickiness will result.

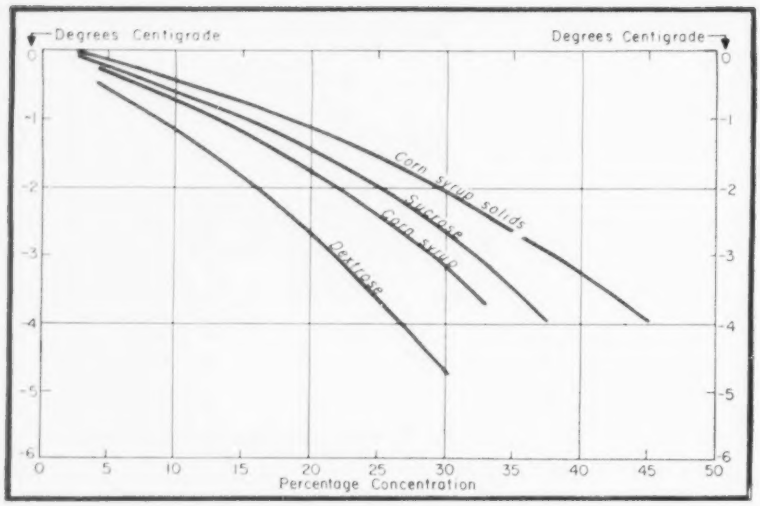
Of interest in ice cream manufacture is the depression of freezing point (see accompanying graph). At equal concentrations the order of most depression is dextrose, corn syrup, sucrose, and corn syrup solids. From this it can be seen that it is possible to produce a corn syrup which would have, for practical purposes, the same depression of freezing point as sucrose.

Uses Are Industry-Wide

TABLE I—SUGGESTED QUANTITY of Corn Sweeteners to Use in Foods

	Product	CSU of Total Sweeteners Percent	Type Corn Syrup (D.E.)	Dextrose of Total Sweeteners Percent	Type Dextrose
Baking	Biscuits	10–100	High	0–100	Hydrate
	Crackers	....	....	0–100	Hydrate
	Bread	50–100	High	100	Hydrate*
	Cake	25–33	High	50	Hydrate
	Sweet goods	15–25	High	50	Hydrate
	Icings	10–25	....	25–50	Hydrate
	Doughnuts	....	....	50–100	Hydrate
	Pie	50	Reg. high*	....	....
Carbonated beverages	Flavors	....	....	20–30	Hydrate
	Colas	....	....	20	Hydrate
	Root beers	....	....	30	Hydrate
Confectioners	Hard candy	25–45	Reg.	....	....
	Marshmallows	50–60	Reg. and high	10–20	Hydrate
	Pastilles or pressed confections	2	Reg.	....	....
	Fudge	25	Reg.	....	....
	Nougats	25–35	Reg.	....	....
	Gum work	33–60	Reg.	....	....
	Fondant	20–35	Reg.	....	....
	Creams	10–25	Reg.	....	....
	Chewing gum	15–25	Reg.	10	Hydrate
	Choc. coatings	10–20	Corn syrup solids	25–100	Anhydrous
Canning	Fruits	25	High*	33	Hydrate*
	Vegetables	....	....	25–50	Hydrate*
	Juices	....	....	33–100	Hydrate*
	Grape	....	....	100	Hydrate*
	Citrus	....	....	100	Hydrate*
Dry Mixes	Gelatin dessert	....	....	30–40	Hydrate, anhydrous
	Puddings	....	....	50	Hydrate
	Summer drinks	....	....	100	Hydrate
	Powders	....	....	....	....
	Pectin	....	....	100	Hydrate
Meat packing	Sausage	100	Special solids	100	Hydrate
	Ham	....	....	100	Hydrate
Flour mills	Pancake mix	....	....	100	Hydrate
	Cake mix	....	....	15–50	Hydrate
	Sugar coated breakfast food	40–50	Regular	....	....
Vinegar	Corn sugar	....	....	100	Hydrate
	Vinegar	....	....	100	Crude 80°
Frozen foods	Bulk	100	High	25	Hydrate
	Package	....	....	25	Hydrate
Salad dressings	....	50–100	High	33–100	Hydrate
Pickles	Sweet	25	High	25–50	Hydrate*
Dehydrated foods	Spray dried juices	100	Special low*	....	....
Baby food	Milk addition	33–100	Reg.	....	....
	Canned	....	....	25	Hydrate
Spice mixing	Seasonings	....	....	100	Hydrate, anhydrous
Preserve	Jelly	25	Reg. or high*	20	Hydrate
	Jam	25	Reg. or high*	20	Hydrate
	Marmalade	25	Reg. or high*	20	Hydrate
Dairy	Ice cream	40	High or solids	25–33	Hydrate
	Vegetable fat base frozen desserts	35–40	Solids, high	....	....
	Sherbets, ices	40	High or solids	33	Hydrate*
	Choc. milk drink	50	High or solids	50–100	Hydrate
Syrups	Table	80–90	Reg.	10	Hydrate
	Fountain	50	High Reg.	10	Hydrate
Peanut butter	....	....	....	100	Anhydrous, hydrate
Caramel color	....	....	....	100	Crude corn 70 or 80 deg.
Alcoholic beverages	Ale	100	Low or high	100	Hydrate
	Beer	100	Regular	100	Hydrate
	Cordials	25–50	High	25–50	Hydrate
	Wines	....	....	100	Hydrate

* Preferred product



FREEZING POINT CURVES show how different sweeteners effect such products as ice cream.

TABLE II—COMPOSITION of Various Types of Corn Syrups

Properties	Classification					
	Low	Regular	High		Specials	
	42 Bé	43 Bé	43 Bé	43 Bé	Dried	43 Bé
Moisture	22.5	19.7	18.9	18.3	3.0	18.6
Color (optical density)	.3	1	1	0.5	...	1.25
Heat color (O.D.)	5	4	4	2.0	...	3.0
D.E. (dextrose equivalent)	28-33	43	55	63	41	54
pH	4.5-5.0	4.7-5.0	4.5-5.0	4.9	5.1	4.7-5.0
SO_2	0.004	0.004	0.0005	0.0002	...	0.0002
Ash	0.20	0.25	0.30	0.05	0.4-0.5	0.05
Copper ppm.	2	2	2	2	...	2
Iron ppm.	1	4	5	1	1	2
Approximate carbohydrates (dry basis)						
Dextrose	11.5	21.0	31.4	36.2	21.4	21.5
Maltose	13.5	20.0	28.1	34.4	20.2	49.9
Higher sugars	20.5	21.0	18.8	19.4	19.5	6.7
Dextrines	54.5	38.0	21.7	10.0	35.9	21.9
Viscosity at 100 deg. F. centipoises	22,000 (43 Bé basis)	13,000	10,000	7,000	...	9,000
Type conversion	Acid	Acid	Acid	Enzyme	Acid	Enzyme
Type refining	Bone black carbon	Bone black carbon	Bone black carbon	Ion exchange carbon	Bone black carbon	Ion exchange carbon

TABLE III—VISCOSITY of Some Corn Syrups in Centipoises

Temperature Deg. F.	42 D.E.	
	42 Bé	45 Bé
60	122,000	2,000,000
120	2,750	33,600
180	287	1,730
	55 D.E.	
60	67,200	1,000,000
120	1,600	16,800
180	167	830

Corn syrup is preferred by some ice cream manufacturers because of its beneficial effect on texture and body.

Principal use of corn syrup solids is in the ice cream industry, with other important uses in icings and baked goods.

Cohesive properties are made use of in such diversified processes as chewing gum and breakfast cereal coatings, and ingredients for cake icings. On sweetened cereals it is necessary to use corn syrup for two reasons: (1) To help prevent stickiness, and (2) to prevent crystallization and sloughing of the coating. The same reasons are involved in the general use of corn syrup in caramel corn manufacture.

Another important advantage of corn syrup is the improved eye appeal it produces in certain finished products. As an example, strawberry preserves look more attractive when corn syrup is incorporated at 25 percent of total solids. Likewise the sheen of an icing is improved, and glacé and frozen fruits look better if corn syrup is employed.

In canned fruits such as pears, apricots, and peaches, as well as in many candies, the lack of sweetness resulting from substitution of corn syrup for sucrose is a positive quality factor. Also, the true fruit flavors, or good imitation ones, used in candy production are accentuated.

Syrups for table use are better when made with large quantities of corn syrup, particularly those for infant feeding, or those consumed with pancakes. Chocolate syrups owe much of their high gloss to the corn syrup content. Moreover, such chocolate syrups are more palatable and less sweet. Fountain syrups usually contain considerable corn syrup.

In 100 percent sucrose packs of preserves and jellies, crystallization frequently occurs when the opened jars are placed in a household refrigerator. This is prevented by use of corn syrup at 25 percent of the sweetener solids. Improvement in color, texture, and flavor of preserves is also noted with corn syrup packs as well as a reduction in sweetness.

Let's examine crystallization further by comparing the carbohydrate composition of various syrups with particular reference to dextrines and D.E. (see Table II). In hard candies, regular corn syrup will give better results than a high D.E. syrup, particularly during those seasons when excessive humidity is encountered. The dextrine content is greater and the D.E. is lower, thus giving the desired properties of crystallization prevention along with less hygroscopicity.

In glacé fruit work, great care must be taken if a high D.E. syrup is used because of its tendency to cause crystallization. Here, a special syrup with a medium high D.E., medium dextrine composition, and a very high maltose content will give splendid results without crystallization.

Properties and Uses of Dextrose

Of major interest is the relative sweetness of dextrose and its effect upon natural flavors.

The usual alpha form does not have the rate of solution or the total solubility of sucrose at lower temperatures, but at accepted levels of usage it has been found to be easily adaptable to most food processes.

Flavors, particularly good natural flavors, are emphasized by dextrose due to its mild sweetness and low masking effect.

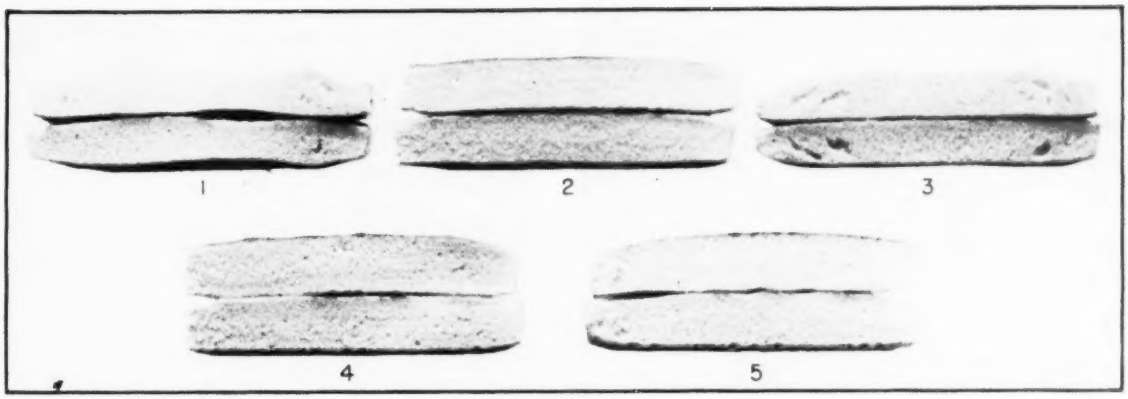
A special example of one of the uses of anhydrous dextrose is found in its application in certain types of flavor work. Here, it has ability to take up about 6 lb. of liquid for every 100 lb. of anhydrous dextrose. Moreover, by recrystallizing in the alpha form, it remains in a dry state.

Another property of importance to the food processor is its superior pre-

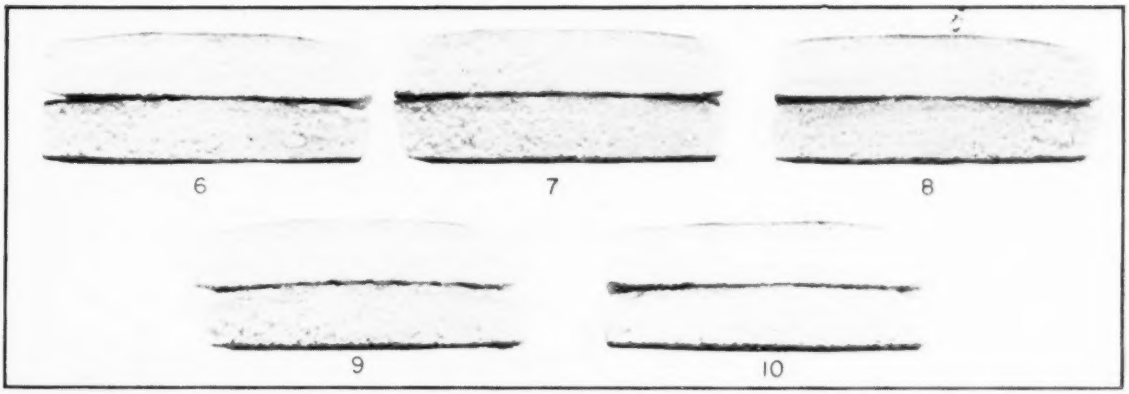
(Turn to page 108)

Ingredient Special

OLD WAY: Irregular, Heavy, and Flat



NEW WAY: Uniform, Light, and Fluffy



COMPARISON of actual baked goods—high-sugar yellow cakes—shows improved quality with new method. At top are cakes mixed, without whipping emulsifier, by conventional methods. Cake (1) incorporated salad oil, (2) plastic butter, (3) plastic lard, (4) regular shortening (plastic), and (5) emulsifying shortening (plastic). Photo above: Cakes prepared by new liquid-shortening method, with whipping emulsifier, Vanade. Cake (6) used salad oil, (7) melted butter, (8) melted lard, (9) regular shortening (melted), and (10) emulsifying shortening (melted). It is borne out here that volume is no longer dependent upon physical characteristics of the fats.

WHIPPING EMULSIFICATION

Cuts Cake Costs, Raises Quality

L. B. CROSSLAND and H. K. BEASLEY

Vanderbilt Foods Corp., East Norwalk, Conn.

Current high manufacturing costs—coupled with the resistance to increases in prices of baked goods—have lowered profit margins on cakes.

Now, however, by using new food emulsifiers with oils or soft fats (in place of plastic shortening), bakers can ease this economic pressure—and up product quality, too. Further, the new method simplifies and speeds up batter-making operations.

The costs savings are realized on labor and ingredients by—

1. Halving the working time required at mixers.

2. Increasing the batter-production capacity. It can be doubled or tripled.

3. Taking advantage of bulk-handling economies through use of oils.

4. Using bland oils, which are less expensive and produce cakes that are easy to handle.

Also, cakes are more uniform, since there is now less dependence on chemical processing, crystal formation, or the temperature history of shortening.

Fats for Aerating Batters

Air is essential for proper leavening of a cake and fats commonly depress the air-holding capacity of egg and water foams. The introduction of hydrogenated oils about 1911 produced fats or shortenings with physical characteristics which permitted them to hold air when subjected to mechanical mixing. These then would produce cakes of better volume and they soon

(*Turn to page* 112)

Carefully sampled . . .

. . . purified by screening . . .

NATURAL SPICES

Add Much More Than Flavor

They improve the aroma and appearance of otherwise unattractive foods . . . add antioxidants that retard development of rancidity in fatty products . . . and give flavor stability to many packaged foods

JOHN J. FRANK
President, American Spice Trade Assn., New York

Just about every branch of the food industry employs spices. And this broad role they play is even more significant, in the sense of "a little amounting to a lot," when we consider that the spice trade in this country ran only about $150 million last year.

Use of spices (see table, p. 80), is primarily to improve the taste, aroma and, in some cases, appearance of foods. Recently however, modern research has demonstrated their antioxidant action toward fats—a characteristic which had long been suspected. This has increased interest in their preservative properties.

What Are Natural Spices?

For the food manufacturer, the term spices today covers about 50 different plant products.

Technically speaking, they come only from the roots, bark, buds, stems, and fruits of tropical and semi-tropical plants. However, leafy herbs from the temperate zones, as well as aromatic seeds and blends of these products, are now considered to be spices within the meaning of the generic term.

Along with the old familiar pepper, nutmeg, and sage, have come such products as chili powder and curry powder. These are not single spices, but blends. Chili powder, for instance, is typically made up of a true spice (chili pepper), an herb (oregano), an aromatic seed (cumin), a mineral (salt), and a vegetable bulb (garlic). Curry is a blend of as many as 16 different spices, herbs, and seeds. Seasoning salts, such as celery, garlic, and onion, are also generally listed as spices.

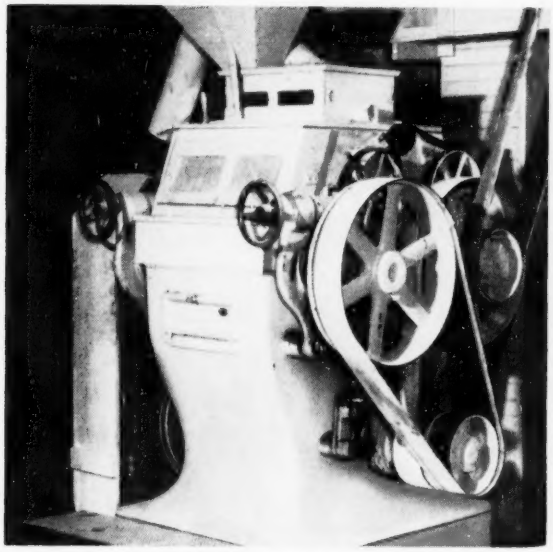
In addition to these basic products, the modern spice grinding concern will usually supply a number of blends that are made up for specific food items. These include anything from sausage seasoning to pumpkin pie spice. And in the meat industry, particularly, the grinder will often develop individual blends for a packer and keep the formulas closely guarded —giving him a distinctive seasoning without the necessity of doing the testing and mixing himself.

Why Use Spices?

Many foods that are basic to nutrition, in the form of fats, carbohydrates, and proteins, have almost no taste of their own. Others that have taste lack aroma, and still others are not attractive enough in appearance to stimulate the appetite.

Spices may either create or bring out one, two, or all three of these appetizing factors in a single product, making it more acceptable. Therefore, while we do not use them in large enough quantities for nutritional significance, they make very important contributions to general human needs.

The flavor that sets natural spice aside from other plant products is found in a complex combination of resins, alkaloids, glucosides, essential oils, and other organic compounds. Each component plays a part, none containing all of the flavor.



. . . then ground to user's specifications

"Natural Spices—

—are ingredients which have been consumer-tested for hundreds of generations. Today's research is simply to pin down what we know empirically to be attributes of these valuable aromatic substances. Spices have stayed in the picture even during the laboratory-food boom of the past 25 years. They have kept pace with the rapid development of the food field. And they offer countless flavor possibilities for the future."

—J.J.F.

We know, for instance, that the essential oil is an important flavor, but the flavor of the spice and that of its essential oil are definitely not the same. This is why grinding of the whole, natural spice remains the only method of obtaining the complete true spice flavor.

From the food manufacturer's standpoint, there is still another practical reason for using the total spice, whole or ground, in his products. Stability of a spice's flavor depends on its cellular structure, which contains natural antioxidants. The flavor-bearing components are held within the cells, and once separated from these protective factors, flavor will diminish quite rapidly.

Fortunately, normal grinding of the whole spice does not entirely destroy its stabilizing cellular structure. Instead, grinding merely starts a process of gradual flavor release, and makes enough available to penetrate a food product thoroughly during processing. But an ample quantity of flavor remains in the ground spice to compensate for any that may be dissipated before the product finally reaches the consumer's dinner table. Even in these days of better packaging and speedier distribution, this stability factor is extremely important.

Incidentally, the stability of ground spice flavor will also hold through freezing. Tests on freezing of sausage conducted at the Georgia Experiment Station showed that the spices used not only retained their own flavor well but also had an antioxidant effect on the fats of the meat.

After 12 months' storage, the only samples that were not rancid and unacceptable were those containing black pepper, sage, or a combination of the two with red pepper. Samples containing salt were the most rancid, and peroxide values correlated with palatability scores. It was concluded that sage and black pepper are good antioxidants and red pepper has some value in preventing oxidation.

Research Programs

Overall merits of whole or ground natural spices as they apply in food manufacturing are currently the subjects of a research program, sponsored by the American Spice Trade Assn. Now in its sixth year, this program is beginning to answer the questions the food processor puts to the spice industry. Namely, "Why should I use natural spices in my products? . . . Do they make them taste better? . . . Are they any better technologically speaking?" . . . etcetera.

Beginning with a project by an independent research firm, the program now has spread to: Hormel Institute, University of Minnesota; American Meat Institute Foundation, University of Chicago; Mellon Institute of Industrial Research, University of Pittsburgh; University of Wisconsin; and University of California.

The independent research firm used a trained panel of taste testers to make a flavor evaluation between natural ground spices and several types of spice substitutes. Feeling was that no mechanical device or chemical process could equal the apparatus of the human body in giving a complete flavor evaluation.

Spice substitutes in general, including oils, oleoresins, sugar- and salt-based extractives, and oils and oleoresins with added emulsifying agents, were found to be of poorer quality in odor and flavor than the corresponding natural spices, whether scored alone or in any of various test foods.

"Extraction of the essential oils and/or oleoresins from natural spices fails," said these researchers, "to yield all of the true flavor components." Their conclusion: "It appears reasonable to assume that, in general, separation of the flavor-bearing components of natural spices from their original cellular loci, replete with natural antioxidants and other protective factors, results in alteration and reduced stability of flavor."

At Hormel Institute the antioxidant properties of natural spices were studied. Results showed that virtually all have the ability to retard rancidity. Moreover, it was found that in most cases the natural products had more preservative power than the essential oil extracts.

For the tests, ground natural spices and solubilized fractions of spices were placed in identical samples of prime steam lard. Of the 32 spices tested, all but four showed greater preservative action in the ground form. Twelve of the soluble fractions even hastened deterioration.

Effects of heat on the preservative properties in spices were tested by placing them in pie crust dough. It was found that all spices normally used in baking increased the stability of the baked goods.

Ingredient Special

Natural Spices, Origins, Foods They Enrich

Spice	Origin	Processing: Meat Products	Baked Goods	Canned Goods, Condiments, Pickles, Beverages, Etc.
Allspice	Jamaica, Mexico	Bologna	Blueberry pie, pineapple tarts, mincemeat, fruit cake, spice cake	Sauces, condiments, gravies
Anise seed	Spain, E. Europe	Peperoni	Cookies, petit fours, coffee cakes	Candies
Basil	India	.....	Rolls	Condiments, sauces, soups, relishes
Bay leaves	Turkey, Yugoslavia	Pickled pork feet	Rolls	Relishes, soups, sauces, condiments
Caraway seeds	Netherlands	Head cheese*	Fillings and doughs of onion breads, cakes, cookies, pastries, muffins**	Pickles
Cardamom seeds	Guatemala, India	Frankfurters	Danish pastry, eclairs, cream puffs	Pickles
Cayenne	Japan, Africa	Sausages	.....	Condiments, sauces
Celery seeds, salt	Europe and India	Pork sausage, Cold meats	Rolls	Pickles, soups, condiments, gravies
Chili powder	U. S.	Chili meats, frankfurters	.....	Condiments, sauces
Cinnamon	India China, Indonesia	Blood sausage	Fruit pies, cakes, buns, sauces, icings, mincemeat	Condiments, candy, pickles, relishes preserves
Cloves	Madagascar, Zanzibar	Liver sausage, meat loaves, baked hams*	Fruit cake, cookies, breads, buns fruit fillings, mincemeat	Condiments, pickles, preserves, puddings
Coriander seed	Argentina, Fr. Morocco	Frankfurters, Bologna	.....	Pickles
Cumin seed	Iran, Fr. Morocco	Sausages, cold meats	.....	Mexican Food specialties
Dill seed	India, U. S.	Liver sausage, Frankfurters, Bologna	.....	Pickles, sauces, condiments**
Fennel seed	India, France	.....	Italian breads*	Pickles, soups
Fenugreek seed	India, France	.....	.....	Condiments, imitation maple extract
Garlic powder	U. S.	Italian type sausages, cold meats	.....	Condiments, relishes
Ginger	Jamaica, African	Pork sausage, frankfurters	Cakes, cookies, wafers, pear tarts, pies	Beverages, condiments
Mace	East and West Indies	Frankfurters, bologna	Sponge and pound cakes, cream fillings, cherry pie	Condiments, relishes
Marjoram	France, S. America	Liver sausage	.....	.....
Mint	U. S. and Europe	.....	.....	Condiments, jellies, confections
Mustard	U. S. and Europe	Frankfurter blends	.....	Condiments, relishes, pickles**
Nutmeg	East and West Indies	Frankfurters, bologna	Doughnuts, cookies, custards, spice cakes, pastry crusts, fruit pie fillings	Condiments
Onion powder, salt	U. S.	Sausages, cold meats	.....	Condiments, relishes, pickles
Oregano	Mexico, Italy	Chili meats	.....	Mexican specialties soups, condiments
Paprika	Spain, Hungary	Several types dry and domestic sausages	Cheese cake	Condiments, relishes
Dried parsley	U. S.	.....	.....	Soups, condiments
Pepper, black	India, Indonesia	Dry and domestic sausages, Italian and Virginia hams	.....	Condiments, pickles
Pepper, white	India, Indonesia	Same as bl. pepper plus almost all other sausage and cold meat products	Christmas cookies	Condiments, soups, sauces, pickles
Poppy seeds	Netherlands	.....	Rolls, breads, cake fillings, doughnuts, cookies, strudels, twists, coffee rings**	.....
Red pepper	U. S.	Pork sausage	.....	Condiments, sauces, pickles, relishes
Rosemary	France, Spain	Pure pork and fresh sausages	.....	Soups, condiments
Sage	Yugoslavia	Pure pork and fresh sausages	.....	.....
Savory	France, Spain	.....	.....	Soups
Sesame seeds	India, Turkey	.....	.....	Confections
Tarragon	Spain, France	.....	.....	Condiments
Thyme	.....	.....	.....	Soups, sauces, condiments
Turmeric	.....	.....	.....	Condiments, pickles

Spices have often been recommended for use in the low-sodium diets given to heart patients and high blood pressure victims. They are used as flavor substitutes for salt, but no authorized study had been made as to their actual sodium content.

At University of Wisconsin, spices were analyzed for sodium content. Results showed that almost all are very low in salt content. The researchers concluded that, with only four exceptions, all of the commonly used spices are safe for these diets. This also applies for those who use salt-free diets in weight-losing schedules. Results of this study are currently drawing attention from the dietetic food branch of the industry.

At the American Meat Institute Foundation, a comparison is being made of the flavor characteristics of natural spices and various spice substitutes in different types of sausages. University of California researchers, meanwhile, are studying spices in the pickle industry. And scientists at Mellon Institute are doing critical studies of analytical methods and standards for spices, herbs, and seeds. Data from these and other projects now being planned should prove of considerable significance.

Buying Spices

The food processor will find it best: (1) To buy the best quality; (2) to buy moderately, and (3) to buy frequently.

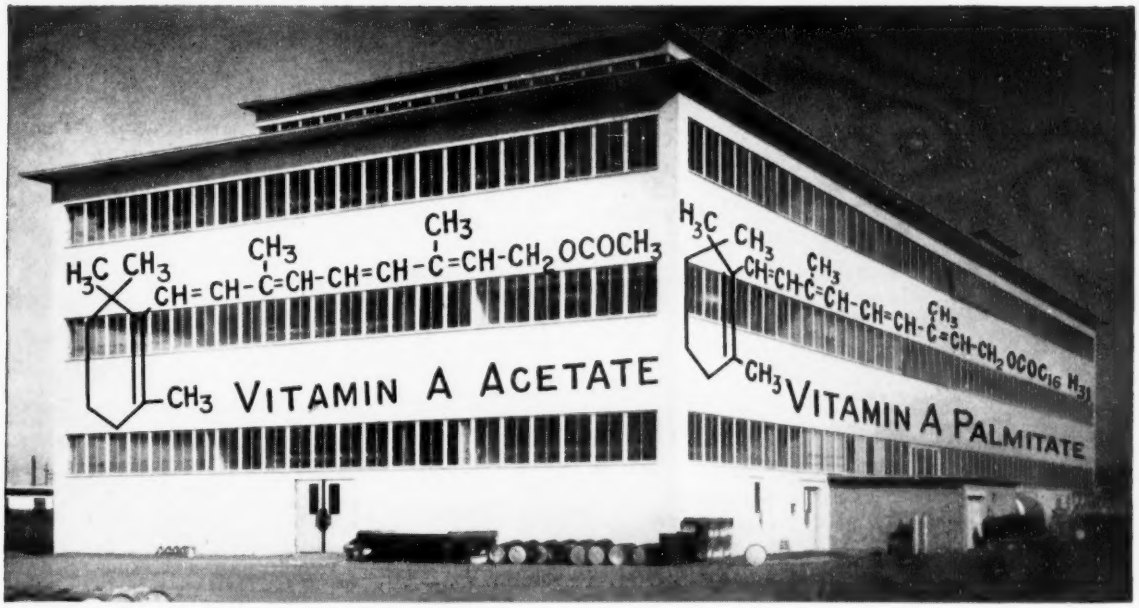
Any reputable grinding firm will be happy to guide the manufacturer to quality spices, for they make steady customers. Generally speaking, though, quality in spices is largely a matter of grade, which indicates the origin.

There is very little variation between the qualities of shipments from the same area. But, when differences do occur, the modern grinder's system of quality control compensates for them. Every shipment is checked by chemists at the grinding plant, and a uniform standard for each grade is maintained by mixing portions of the more potent lots with those that are slightly weaker.

Despite the fact that most of the natural spice's protective structure survives the grinding, the pulverized spices will not retain their flavor forever. The slow process of flavor release has been started at the mill. Modern packaging serves to keep the flavor fresh enough through any normal storaging. But obviously, the sooner spices are used after grinding the more potent they are.

Therefore, though not a necessity,

(*Turn to page 112*)



ONE OF NEW facilities insuring adequacy of vitamin A production—plant of Hoffmann-La Roche, Inc., Nutley, N. J.

SYNTHETIC VITAMIN A

Aids Food Fortification

In margarine, extensive research tests show synthetic vitamin equals natural product in stability, excells it in flavor. Also found suited for fortifying candies, ice cream, peanut butter

J. C. BAUERNFEIND, ANN D. ROKOSNY and G. F. SIEMERS
Hoffmann-La Roche Inc, Nutley 10, N. J.

Synthetic vitamin A is admirably suited for fortification of food, as is evidenced by flavor and vitamin stability studies in finished margarine. And cooking trials with this fortified margarine demonstrate high vitamin retention in cakes, cookies, white sauces, and frostings.

Successful fortification trials with confections, frozen dairy products, pediatric and geriatric products indicate that synthetic vitamin A should have high appeal in the food industry where fortification is warranted.

Today a new era of vitamin A history is well underway with several manufacturers offering an economy-improved, quality-standardized and controlled product to the food industry.

Margarine may contain a claimed vitamin A content of 15,000 U.S.P. units per pound obtained from either synthetic or natural sources, according to the 1952 Federal definitions and standards of identity. Standardized vegetable oil dilutions of synthetic vitamin A containing 100,000 to 1,000,000 U.S.P. units per gram are available in bulk containers for margarine fortification. The palmitate, in concentrations of 500,000 to 1,000,000 units per gram, and the acetate in concentrations of 100,000-250,000 units per gram are extensively employed. Oil dilutions of concentrations of 100,000 units per gram or higher, in ready-to-use packages designed to meet individual margarine batch requirements, are in common usage.

Vegetable oil dilutions of synthetic vitamin A were subjected to accelerated aging (1,000 and 2,000 hr. at 113 deg. F.) and to normal storage conditions (8 and 12 months at 72-80 deg. F.) in order to establish their stability characteristics. Data indicate excellent stability in sealed containers. In actual commercial practice these oil dilutions are prepared a few days or weeks before they are required by the margarine producer and upon shipment are usually used within a 30 to 60 day period.

Fortification Studies

Commercial fortification of margarine was set up with manufacturers using oil dilutions of synthetic vitamin A acetate and palmitate. In most instances fish oil concentrate was run simultaneously for comparison.

Fortified margarine containing synthetic and natural A were subjected to four types of storage conditions: (1) Refrigerator temperature, 40 deg. F.; (2) room temperature 72-75 deg.

Ingredient Special

TABLE I—RETENTION of Vitamin A in Margarine Is Confirmed by Storage Tests
(U. S. Pharmacopoeia units of Vitamin A per pound by Carr-Price Assay[1])

Manufacturer	Source of Vitamin A	Initial Assay	After 6 Weeks Storage		After 12 Weeks Storage				After 4 Months Storage At	After 6 Months Storage	
			72 Deg. F.	86 Deg. F.	40 Deg. F.	40-72 Deg. F.[2]	72 Deg. F.	86 Deg. F.	40 Deg. F.	40 Deg. F.	72 Reg. F.
A	Fish oil concentrate	20,300	.....	.....	.....	18,600 (92)	18,200 (90)	18,200 (90)	.....	18,500 (91)	17,500 (86)
A	Synthetic vitamin A acetate[3] 200,000 U.S.P. units per gram	21,250	.....	.....	.....	20,200 (95)	19,500 (92)	20,900 (98)	.....	18,800 (88)	19,000 (89)
A	Synthetic vitamin A palmitate, type PIMO, 1,000,000 U.S.P. units per gram	17,000	16,900 (99)	17,200 (101)	.....	18,700 (110)	18,000 (106)	.....	15,500[5]	.....	.....
B	Fish oil concentrate	19,350	17,450 (90)	17,650 (91)	17,100 (88)	18,000 (93)	17,200 (89)	15,600 (81)	.....	16,600[5] (86)	16,900[5] (87)
B	Synthetic vitamin A acetate[3] 200,000 U.S.P. units per gram	14,550	14,150 (97)	14,000 (96)	14,900 (102)	14,900 (102)	15,000 (103)	14,500 (100)	.....	15,300[5] (105)	14,900[5] (102)
C	Synthetic vitamin A acetate[4], 200,000 U.S.P. units per gram	14,500	14,500 (100)	14,000 (97)	14,600 (101) 15,600[5]	14,900 (103)	14,700 (101)	15,500 (107)	.....	16,100 (111)	.....
D	Synthetic vitamin A acetate[3], 100,000 U.S.P. units per gram	19,500	18,900 (97)	17,200 (88)	.....	20,200 (104)	19,500 (100)	.....	19,300[5]	20,600 (106)	22,400 (115)
D	Synthetic vitamin A acetate[3], 400,000 U.S.P. units per gram	17,600	18,200 (103)	.....	.....	18,900 (107)	19,300 (110)	.....	.....	18,600 (106)	18,800 (107)
E	Fish oil concentrate	16,900	18,400 (109)	18,300 (108)	.....	17,600 (104)	.....	18,500 (110)	.....	.....	18,100 (107)
E	Synthetic vitamin A acetate, type AIMO, 1,000,000 U.S.P. units per gram	16,200	16,300 (101)	16,100 (99)	.....	17,500 (108)	.....	17,600 (109)	16,800[5,6]	17,200 (106)	.....
E	Synthetic vitamin A acetate[3], 200,000 U.S.P. units per gram	17,300	16,500 (95)	16,300 (94)	.....	15,200 (88)	.....	17,200 (99)	17,700[5]	16,400 (95)	16,400 (95)
F	Fish oil concentrate	18,700	18,200 (97)	17,100 (91)	.....	19,800 (106)	18,000 (96)	.....	.....	18,700 (100)	16,000 (85)
F	Synthetic vitamin A acetate[3], 200,000 U.S.P. units per gram	17,000	17,000 (100)	17,300 (102)	.....	19,700 (116)	17,100 (101)	.....	15,200[5]	18,900 (111)	15,500 (91)
G	Fish oil concentrate	14,700	.....	13,200 (90)	.....	14,600 (99)	14,100 (96)	.....	.....	16,300 (110)	13,900 (95)
G	Synthetic vitamin A palmitate[3], 400,000 U.S.P. units per gram	17,700	.....	14,800 (84)	.....	17,700 (100)	16,400 (93)	.....	17,000[5]	18,900 (107)	15,800 (89)
H	Fish oil concentrate	18,800	.....	16,300 (87)	.....	19,100 (102)	19,100 (102)	.....	.....	19,100 (102)	16,600 (88)
H	Synthetic vitamin A palmitate[3], 200,000 U.S.P. units per gram	17,900	.....	17,100 (96)	.....	17,800 (99)	17,400 (97)	.....	17,500[5]	20,000 (112)	17,400 (97)
H	Synthetic vitamin A acetate[3], 200,000 U.S.P. units per gram	18,000	.....	18,100 (101)	.....	18,400 (102)	17,600 (98)	.....	17,400[5]	19,500 (108)	17,500 (97)

[1] In most instances values represent single chemical assays. Assays conducted by F. Jahns and associates, Roche Nutrition Laboratories.
[2] Alternately subjected to 40 and 72 Deg. F. for 24–60 hr. periods.
[3] A cottonseed oil dilution.
Note. Figures in parentheses are percent retention based on initial assay value.
[4] Biological values by U.S.P. rat assay method. Assays conducted by W. Marusich, Roche Nutrition Laboratories.
[5] After 5 months of storage.
[6] After 7 months of storage.

TABLE II—FOODS Prepared with Synthetic A Fortified Margarine Show Good Retentions

Food Product	Added Vitamin A	Vitamin A Content: Uncooked Preparation	Vitamin A Content: After Cooking	Vitamin A Content: After Cooking (Moisture Corrected)	Retention Percent
	(U. S. Pharmacopoeia units/100g. by Carr-Price Assay)				
Chocolate cake	0.0	...	0.0[a]	...	...
Chocolate cake	450	490	450	420	93
Yellow cake	540	620	650	590	109
White cake	0.0	...	0.0[a]	...	...
White cake	470	520	570	505	107
Cookies, butterscotch slices	0.0	...	0.0[a]	...	...
Cookies, butterscotch slices	1,120	1,000	1,000	840	75
Cookies, vanilla drops	1,020	910	1,180	950	93
White sauce, Test 1	400	.....	560	450	112[b]
White sauce, Test 2	390	.....	540	450	115[b]
White sauce, Test 3	360	.....	520	420	117[b]
Non-cooked frosting, Test 1	900	1,020	.....	...	...
Non-cooked frosting, Test 2	890	1,040	.....	...	...
Cooked frosting	390	.....	370	...	95

[a] Yellow color (atypical) produced in Carr-Price assay which, if calculated as vitamin A, would amount to about 10 U.S.P. units per gram.
[b] Whole fluid milk used in the recipe probably enhanced vitamin A value.

F.; (3) alternating refrigerator and room temperature, and (4) at 86 deg. F. In most instances the latter temperature caused partial softening of the margarine.

Data on products prepared by ten manufacturers (Table I) reveal synthetic vitamin A to be equally stable to that from natural sources. Furthermore, the data reveal that manufacturers add an overage to insure labeled vitamin content.

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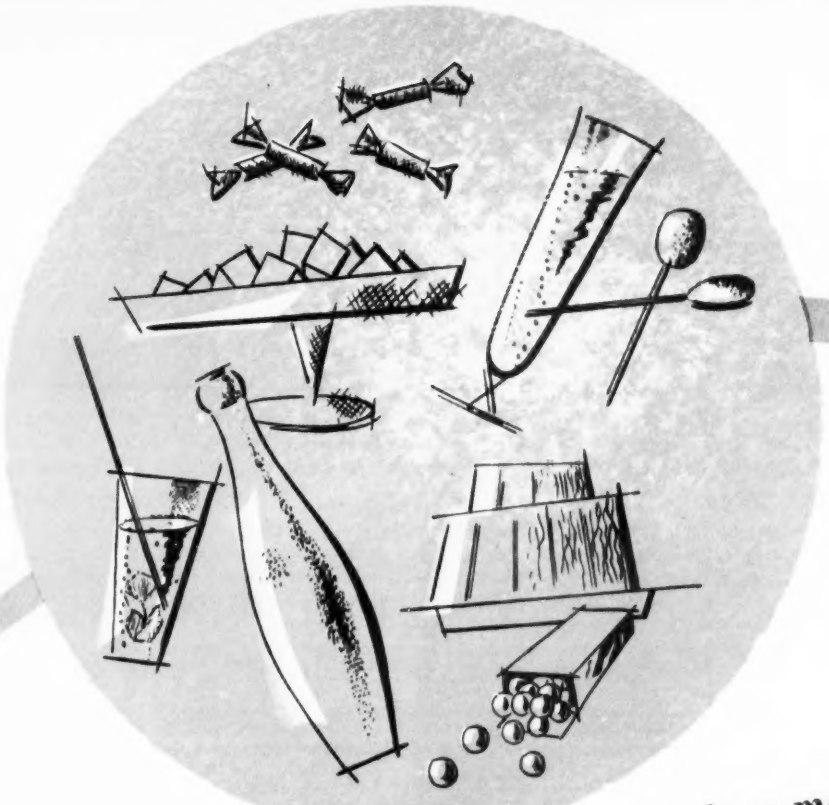
Average initial vitamin A content of the fortified margarine, as determined by Carr-Price assay, was 17,625 U.S.P. units per gram. This compares well with the average value of 18,425 U.S.P. units reported by Murray *et al.* for Canadian fortified margarine.[2] Biological assay data substantiate the chemical data, as illustrated in Table I. Importance of this relationship has been recently emphasized by Melnick *et al.*[3]

In a flavor-comparison study by the Roche Applied Nutrition Laboratory six brands of margarine fortified with synthetic vitamin A and fish oil concentrate were examined under code. No significant differences were found in five brands, but in the sixth, a "fishy" flavor was noted in the sample fortified with fish oil concentrate.

Standard type cakes and cookies, in which a commercially prepared margarine fortified with synthetic vitamin A served as the fat source, were baked in a home type electric range at an oven temperature of 375-400 deg. F. White sauce and cake frostings were also prepared to examine behavior of synthetic vitamin A during processing. Results (Table II) confirm the findings of Rice *et al.*,[4] who reported that in biscuits, cake, and bread prepared from fortified fats it appears that 80-100 percent of the vitamin survives the baking process.

Confections

The Food & Container Institute has been interested in vitamin enriched chocolate and confections as components of Army rations.[5] With this interest in mind, a series of trials was set up fortifying confection products with synthetic vitamin A. The data (Table III) demonstrate that fairly good stability can be achieved. An



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added overage of 15-33 percent beyond the claimed vitamin A value may be necessary, depending on expected storage conditions.

Caramels were prepared from a basic formula consisting of corn syrup, hydrogenated coconut oil, sugar, milk solids, and lecithin. Vitamin A palmitate and vitamin D were introduced in the coconut oil ingredient prior to processing. The entire mixture was cooked for approximately 18 min. to a temperature of 240 deg. F.

Ration Bars Fortified

Chocolate rations bars, produced in commercial equipment, were fortified with vitamin A and other vitamins on the basis of 1 oz. of chocolates supplying 50 percent of the N.R.C. recommended allowances which, in the case of vitamin A, would be 2,500 U.S.P. units per ounce. Vitamin A acetate or palmitate was carefully mixed into small portions of the chocolate-cocoa butter base. The ingredients of the bar, namely chocolate liquor, cocoa butter, sugar, salt, milk, vanillin, and lecithin, were mixed together, passed through the roll refining mill and the melangeur, and molded into bars.

Chocolate fudge was prepared according to commercial procedure from heavy cream, sugar, corn syrup, and evaporated milk. All ingredients were mixed together and heated to 240 deg. F. The candy mass was cooled to 150 deg. F., at which point melted shortening containing vitamin A was incorporated. Shortly thereafter the mixture was poured.

Molasses taffy has been successfully fortified with synthetic vitamin A. The basic candy was made from corn syrup, sugar, condensed milk, butter, water, and molasses. The candy was cooked to 250 deg. F. and poured onto a marble slab. Vitamin A palmitate concentrate and vitamin D were folded in on the slab. At a temperature of 130 deg. F. the candy was pulled, then cut and wrapped.

Peanut Butter

Because of the high fat and low vitamin A content of peanut butter, much interest has been expressed in its fortification with vitamin A. A few laboratory trials and one small production run have been made on the incorporation of a peanut oil or other vegetable oil dilution of synthetic vitamin A. Usually 1 oz. of the oil has been mixed into 100 lb. of freshly ground peanut butter at a temperature of approximately 140 deg. F. Data (Table III) indicate that synthetic vitamin A has sufficient stability characteristics in peanut butter to warrant its consideration as a vitamin carrier.

TABLE III—CONFECTIONS and Other Products Show Good Vitamin A Values

Product	Added Vitamin A	After Manufacture	After Storage		
		(U. S. Pharmacopoeia units vitamin A per ounce)			
			500 Hr. At 113 Deg. F.[1]	1,000 Hr. At 113 Deg. F.[1]	1,500 Hr. At 113 Deg. F.[1]
Confections					
Caramels[2]	1,090	990	1,060		1,270
Milk Chocolate A	0	trace			
A[3]	2,825	2,800	2,540	2,600	2,640
B[3]	3,325	3,400	3,100	3,000	2,750
C[3]	3,325	3,200	3,050	3,050	3,100
Chocolate Fudge[4]	3,120	3,540	4,020	3,710	
Molasses Taffy[5]	1,750	1,780	1,730		
			12 Months At 72 Deg. F.	6 Months At 86 Deg. F.	12 Months At 98 Deg. F.
Caramels	1,090	990	1,190		1,160
Milk Chocolate A[3]	2,825	2,800	1,930	2,180	1,920
B[3]	3,325	3,400	2,440	2,520	2,260
C[3]	3,325	3,200	2,660	2,550	2,240
			500 Hr. At 113 Deg. F.	1,000 Hr. At 113 Deg. F.	
Peanut Butter					
Laboratory run A[3]	1,560	1,590		1,380	
B[3]	1,560	1,500		1,510	
Plant run[2]	2,210	2,210	2,030		
				6 Months At 72 Deg. F.	12 Months At 72 Deg. F.
Pediatric and Geriatric Products[6]					
Dry milk or modified milk products A		2,130	2,000	1,940	1,970
B		1,620	1,730		1,840
C		1,210	1,030	990	1,030
		(U. S. Pharmacopoeia units vitamin A per pint[7])			
				6 Months At 72 Deg. F.	12 Months At 72 Deg. F.
Canned liquid milk products A		3,200	3,210	3,325	
B		1,620	1,500	1,510	1,380
C		4,450	4,150		3,500
D		1,430	1,390	1,250	1,290
			6 Weeks At 0 Deg. F.	24 Weeks At 0 Deg. F.	
Ice Cream[7]					
Trial A	0	1,300			
B	3,320	4,260	4,040	4,800	
C	3,320	4,120	4,560	4,600	
D	4,800	6,200	5,240	5,740	

[1] As determined by Carr-Price assay.
[2] Vitamin A palmitate, type PL 3, 1,300,000 U.S.P. units per gram.
[3] Vitamin A palmitate, type PIMO, 1,000,000 U.S.P. units per gram in oil.
[4] Vitamin A acetate, type AIMO, 1,000,000 U.S.P. units per gram in oil.
[5] 14 months storage.
[6] Vitamin A per pint as consumed.
[7] 12 percent butterfat, 11 percent serum solids, 17 percent sugar, 0.3 percent stabilizer (1 pint equals 282g.).

Ice Cream

A number of reports have appeared in which ice cream was assayed for its natural vitamin content.[6] In the present study, stability of added synthetic vitamin A was determined, since other dairy products such as whole fluid milk[7] and nonfat fluid milks[8] have been commercially fortified.

The study was conducted with a small commercial type double-tube Vogt continuous ice cream freezer. Synthetic vitamin A concentrate, as a vegetable oil or butter oil dilution, was added to the mix prior to homogenizing (1,500 psi., 160 deg. F.). The homogenized, pasteurized vanilla mix was fed into the freezer, frozen within eight seconds to a thickened form, and filled into cylindrical cardboard containers to be placed in a hardening room and finally in a storage room. A tasting of the products after manufacturing demonstrated no off-flavors were incorporated by the addition of the synthetic vitamins. Stability data appear in Table III.

Other studies with 6 and 12 percent vegetable fat frozen products similarly indicate that synthetic vitamin A can be incorporated prior to freezing with little or no loss during freezing and storage. The very low original vitamin A content of these frozen products reflects the complete absence of the vitamin from the fat source.

Pediatric and Geriatric Products

Synthetic vitamin A has been successfully administered as the sole source of vitamin during early infancy.[9] Investigators in infant nutrition have proved vitamin A stores at birth to be variable but liver stores [10] as well as blood levels[11, 12] increase following vitamin A supplementation. While cow's milk may supply adequate vitamin A[13], its content varies[7, 14, 15] and supplementation is desirable.[16]

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been demonstrated to result from increased dietary allowances of vitamin A,[17, 18, 19] since the diet of many older persons may suffer from lack of variety of foods,[20] and since it is difficult to assess the level of vitamin A nutrition of humans because of the great storage capacity for vitamin A,[21] it is probably desirable to provide some added vitamin A in special dietary foods designed for the aged.

Synthetic vitamin A palmitate concentrate, as such or diluted with oil, has been introduced in liquid pediatric and geriatric milk products prior to homogenizing and before the canning and sterilizing operation. In the preparation of the dry milk products for infants or the aged it is possible to introduce the synthetic vitamin A either prior to vacuum pan concentration or after it by the homogenizing step. The final product is then spray dried in a conventional fashion. Table III summarizes data obtained on pediatric and geriatric type products. Very satisfactory vitamin A stability has been obtained. It is suggested that 10-25 percent excess be added beyond claim values in order that the processed and stored product contain the proper vitamin level.

General Facts on Synthetic A

Vitamin A, an unsaturated cyclic alcohol ($C_{20}H_{29}OH$) discovered by McCollum and Davis,[22] is a pale yellow, oil-soluble substance. It is needed in the diet of man and animals to maintain the structure and function of certain specialized epithelial and glandular tissues. Also, for resistance against infections, for visual functioning of the retina and for promoting growth of the body.[10, 23]

It is required by the adult human body in *minimum* daily amounts of 4,000 U. S. Pharmacopoeia units.[24] The adult dose used in therapy may vary from 50,000-200,000 units daily in divided doses.

In amounts used in food fortification, vitamin A is considered nontoxic. For example, the ratio of the quantity required daily for optimum nutrition to the toxic dose is said to be 1 to 7,500.[25] It is apparent, therefore, that there is a very wide margin of safety.

Vitamin A, as consumed in food, is absorbed primarily in the normal intestine, is esterified in the walls of the intestine, and is carried as an ester in the lymph and blood to the storage depots of the body.[26] The liver contains about 90 percent of the entire quantity found in the body and possesses a large capacity for storage. Vitamin A deficiency, its relationship to the predisposing diseases, availability of the natural product in our foods, as well as its relationship with other vitamins such as C and E, have been previously reported[27, 28, 29, 30, 31, 32, 33] or reviewed.[10, 23, 26, 31, 35]

Approximately seven years have elapsed since the first laboratory synthesis of vitamin A, three years since the announcement of high quality, large volume commercial production.[36, 37] Production remains a complicated procedure requiring specialized equipment, careful control, and specifically trained personnel.

Citral from lemon grass oil is converted by a 12-step batch process to produce an acetate which, by saponification and reaction with palmitic acid, yields vitamin A palmitate, the two forms in commercial use.

Vitamin A acetate in pure crystalline form supplies 2,907,000 U.S.P. units per gram. Pure vitamin A palmitate supplies 1,818,000 U.S.P. units per gram.

The pharmaceutical and food industries have preferred concentrates of these esters prepared as an oil dilution standardized to contain 1,000,000 U.S.P. units or less per gram. Advantages of these standardized products are: (1) Greater stability; (2) greater ease of handling, and (3) simplicity in calculating and adding required quantities in fortification procedures.

One outstanding superiority of the synthetic vitamin lies in the freedom from the fish odor and taste usually associated with natural preparations. The synthetic product also eliminates the problem of the hypersensitive person who shows an idiosyncrasy to fish oil.[38]

Synthetic vitamin A is subject to the same oxidative changes and loss of activity as might be encountered, for example, with a highly purified natural concentrate. Containing considerably less extraneous material than fish oil concentrates, the synthetic product permits greater specificity in selection of antioxidants, stabilizing or protective agents, if needed.

Synthetic vitamin A has been described in the *U. S. Pharmacopoeia*[39] as a fully acceptable compound for pharmaceutical products. Official sanction has also been given to the product for margarine fortification as a result of the May 1952 definitions and standards of identity for oleomargarine.[1] In January 1953 the Bureau of Animal Industry, USDA, amended its margarine regulations to conform with the new definitions and standards of identity promulgated by FDA[40].

It must be recognized that a fundamental principle involved in adding a vitamin supplement to a food product is one of absolute reliability and responsibility of the manufacturer to the consumer for claimed vitamin content. In the 14th revision of the *U. S. Pharmacopoeia*,[39] the quantitative spectrophotometric determination of vitamin A with a quantitative identification test based on the color reaction with antimony trichloride became official. This change replaced the older bioassay method and has proved satisfactory for high potency products.

Substantially the same procedure has been adopted by the Assn. of Official Agricultural Chemists[41] for assaying fish liver oils used for animal feeding purposes. In the case of some food products it is difficult to conduct spectrophotometric analyses, and the most widely used chemical method, the Carr-Price procedure, is related to the bioassay values obtained by the U.S.P. rat assay method.

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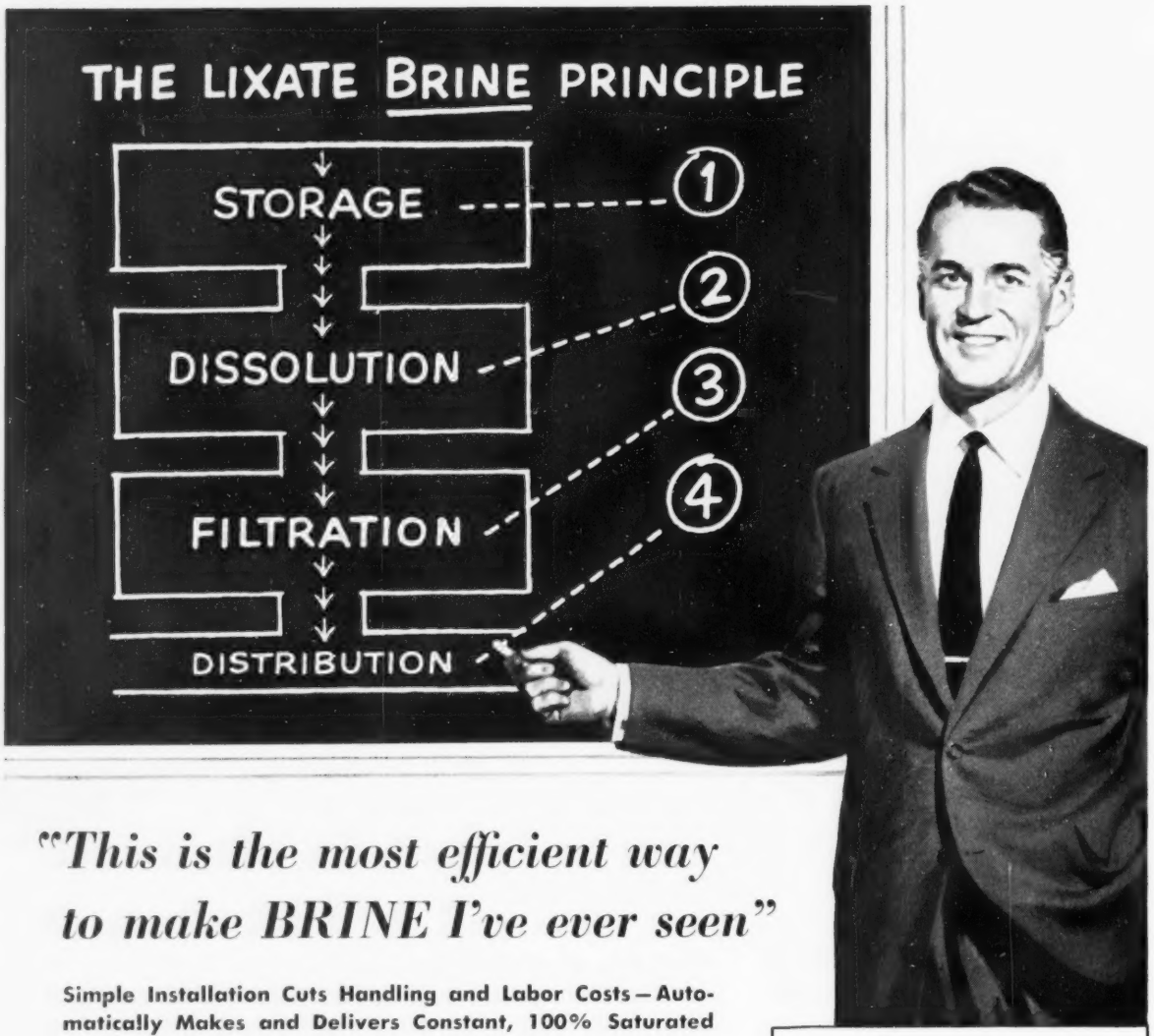

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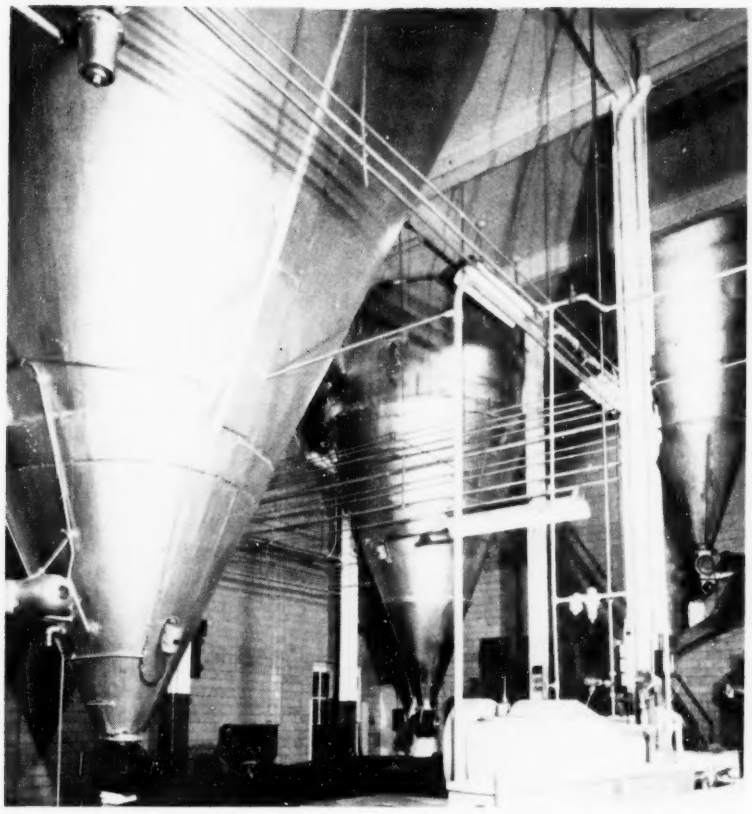

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Glycose + Oxygen = Gluconic acid.

There are, in principle, two uses of this enzyme: First, for removal of glucose (provided there is enough oxygen present); second for elimination of oxygen (if there is an excess of glucose in the system).

Both have practical value to the food chemist. A number of additional practical applications presently are being investigated. One, which has now become a routine, is the enzymatic removal of glucose from egg whites and other egg products prior to drying.

Since other applications involving removal and conversion of glucose in food products and beverages must basically use the same procedure, here's the method detailed:

Desugaring Egg Whites

To oxidize all glucose in a food to gluconic acid, an excess of oxygen must be provided by adding hydrogen peroxide. The enzyme, catalase (which is present in addition to the glucose oxidase in commercially available enzyme products supplied for this application) decomposes the hydrogen peroxide and thus supplies the needed oxygen:

$$2H_2O_2 \xrightarrow{\text{catalase}} 2H_2O + O_2$$

For desugaring liquid egg whites before drying, this method is generally being used:

Egg whites are placed in a jacketed tank (preferably stainless steel and *not* iron) which is equipped with a slow-moving agitator and a cover to prevent drying of the foam. The pH is adjusted to 7.0-7.5 by adding hydrochloric, lactic, or citric acids, and the temperature is then raised to 85-90 deg. F., at which level it should be held throughout the treatment.

Now the enzyme is introduced and gently mixed into the batch. Agitation should continue during treatment.

Enzyme preparations are supplied in concentrated and diluted forms. For each 1,000 lb. of liquid egg white there should be used 50g. of the concentrated enzyme powders or 1 lb. of the dilute liquid enzymes.

Addition of hydrogen peroxide is best accomplished by a proportioning device, which continuously feeds the peroxide during the first 6 hr. of the 7-hr. treatment. A total of 0.5 percent of hydrogen peroxide (35 percent strength), based on weight of the liquid white (5 lb. per 1,000 lb. of whites), is required. If no proportioning device is available, the peroxide may be added in "shots" every half hour, using a double shot at the beginning and none at the last half hour.

The egg whites are then finished and dried in the usual manner.

To check completeness of desugaring, glucose determinations may be made on samples with the Somogyi reagent.[1]

A less exact, but more rapid, evaluation is made by quickly drying a few milliliters of the white 5-10 min. un-

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der a heat lamp. Absence of browning, in this case, indicates complete desugaring.

This simple test can also be used to check progress of enzyme treatment in a roughly quantitative way. Samples withdrawn and dried at various time intervals are compared with previously prepared standards.

For Yolks and Whole Eggs

Except for minor adaptations, the process described for whites is used for desugaring whole eggs and yolks. Adjustment of the pH of the batch is not required. A slightly higher temperature, up to 100 deg. F., is preferable, and a greater amount of enzyme should be used. To desugar a 1,000 lb. batch of yolks or whole eggs in about 3½ hr., procedure is to add 150g. of solid concentrated enzyme or 3 lb. of the liquid product.

This shorter treatment time lessens the possibility of bacterial contamination. The quantity of hydrogen peroxide needed is the same as described for treating egg whites.

Egg solids prepared by enzyme treatment are perfectly stable when stored. This is in contrast to egg solids which have not been desugared.

Treated whites and whole eggs also show no browning—a reaction which occurs when egg products are dried without desugaring, especially in the presence of glucose and proteins[2] and also cephalin[3]. Enzymatic removal of the glucose prevents these destructive reactions.

Desirability of sugar removal had long been recognized, and other methods were recommended and practiced. These were used to a limited extent before the enzyme, glucose oxidase, had been developed by B. L. Sarett of Vita-Zyme Laboratories, Inc., Chicago, (licensor of the process). Later, it was applied to egg processing by R. R. Baldwin in the laboratories of General Foods Corp., also to commercial-size operations at the plants of Henningsen, Inc.

Earlier desugaring methods[4, 5] employed fermentation with live organisms (yeasts and bacteria). They often created difficulties and yielded unsatisfactory products.

Chief disadvantages of the fermentation technique were: (1) Inability to predict the vigor or activity of a particular culture of organisms, (2) difficulty in maintaining the cultures fully active and free of contaminants, (3) almost unavoidable increase in bacterial count of the egg solids when live organisms were used, and (4) weight losses in drying due to the formation of volatile products of fermentation.

These shortcomings are avoided by employing the enzymatic method. Conditions existing in the batch and the presence of hydrogen peroxide are unfavorable for propagation of microorganisms and bacterial contamination.

Advantages of New Technique

Carefully standardized, uniformly potent enzyme preparations guarantee consistent results. Enzyme treatment soon becomes a routine matter requiring little supervision. Only one chemical reaction takes place—oxidation of the glucose. Fats, proteins, and other egg constituents are not chemically changed. This, however, is true with the fermentation process. Live organisms contain varying amounts of many different kinds of enzymes, which produce chemical changes often resulting in off-odors and off-flavors.

No separation of the mucin fraction occurs, since glucose oxidase treatment is performed at pH values high enough to avoid mucin precipitation. As a result, the whipping quality of the dried egg white is fully retained.

Manufacturers of prepared cake mixes were quick to realize the advantages of using enzyme-treated egg solids. Immediately, they adopted desugared dried egg white, because it is of a sufficiently high standard, uniformity, and whipping quality to be ideally suited for incorporation into angel food cake mixes.

The Quartermaster Corps, too, is experimenting with the enzyme process and testing the stability of the enzymatically processed eggs. Its present specifications[6] are written around a process that includes acidification with hydrochloric acid before drying. However, it is recognized that this process has undesirable features—corrosion of equipment and the necessity of making provisions for neutralization of the acid in the dried product.

Impact on Frozen Eggs

It is generally accepted that the ready availability of stable, enzyme-treated, dried egg solids will make great inroads into the market for frozen egg products, especially in the baking field.

Advantages of using enzyme-treated rather than frozen eggs are: (1) Elimination of need for refrigerated storage and shipment, (2) great reduction in shipping weight, (3) simplified packaging, (4) possibility for a baker to make last minute decisions on how much egg powder to use without waiting for frozen eggs to thaw, and (5) greater processing flexibility.

Lack of a surplus of eggs and abnormally high egg prices have prevented, to date, a large-scale replacement of frozen with stabilized dried eggs. Under these abnormal conditions, eggs are not dried for inventory purposes but almost exclusively for orders.

These advantages and resulting savings far exceed the added cost of enzyme treatment which, in this case, is twofold—cost of the enzyme preparation, and a royalty for the license to use the process.

Browning of Fruits, Vegetables

To what extent enzymatic conversion of glucose with glucose oxidase can be used to prevent browning of fruits and vegetables is a matter calling for further investigation. In certain cases, there are definite possibilities, since it is known that browning of vegetables during canning and dehydration can be caused by a Maillard-type reaction between sugars and proteins. In this case (and the same is true for this type of non-enzymatic browning of fruits), glucose oxidase conversion of the sugar to gluconic acid would remedy the defect.

It should, however, be understood that treatment with glucose oxidase can be effective only where the sugar involved is glucose—the enzyme is specific for this particular hexose. It will not oxidize fructose, which also can undergo a Maillard type reaction with proteins and thus cause browning.

Where glucose is the culprit, penetration of glucose oxidase into the vegetable or fruit tissue remains a problem. Purees, however, would more readily lend themselves to such treatment.

Browning caused by other reactions—oxidation of phenols and formation of quinones and other oxidation products that are catalyzed by the naturally present enzymes, tyrosinase and peroxidase—can, under certain conditions, be prevented by excluding oxygen.

Removal of Oxygen from Beer

Use of the glucose oxidase, for which there are many possible applications in the processed food[7] and beverage fields, is best explained by describing the removal of residual oxygen from bottled or canned beer.

Oxygen present in greater than a minimum permissible amount will reduce the shelf-life of the beer, making it turbid and off-flavored. It may enter the beer during filling operations, especially when the fillers do not efficiently flush out (with CO_2 foam) the air-head space in the bottle or can. With modern machinery and careful operators, this condition rarely occurs. Consequently, the use of glucose oxi-

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CASE HISTORY #77 Schoettle makes 35 different boxes for this customer*, Mr. Big in electronic industry. Company decided it unnecessary to box a certain part and allowed inventory to deplete . . . Decision was suddenly reversed . . . Purchasing Agent found himself in a tough spot. Needed boxes . . . three colors and varnish . . . in ten days—and no cutting corners on quality! Schoettle delivered on time, of course!

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dase will, in this instance, be limited.

The application, however, shows what can be accomplished in similar related instances.

The limited amount of glucose present in beer is sufficient for glucose oxidase to consume oxygen from the head-space or from air churned into the beer during pumping. Only small amounts of glucose oxidase are needed, although the time period is limited from the moment the bottle is capped until the enzyme is inactivated during pasteurization. Required for 100 barrels (31 gal. each) of beer are 2 lb. of the dilute liquid enzyme or 3-4 oz. of concentrated powdered product.

This proportion should be the basis for such applications as in fruit juices and syrups, cola drinks and syrups, and canned fruits and vegetables. As yet, little research has been carried out in this field or on related uses of glucose oxidase in packaged foods (where air entering through a wrapper causes discoloration and flavor deterioration).

Making Glucose Oxidase

Glucose oxidase is derived from specially selected strains of fungi. Methods of growing these fungi and extracting the enzyme are similar to the manufacture of antibiotics, even to the extent that the same deep-tank fermentation equipment is used.

Preferred for commercial purposes are the less costly enzyme preparations, which contain such impurities as other proteins and inert substances derived from the enzyme-producing organism. After considering the fact that removal of these impurities would be prohibitively costly, it is pertinent to point out that they actually afford an advantage—by exercising a desirable stabilizing effect necessary to give the enzyme preparation longer shelf-life.

Presence of these inert, harmless impurities in a commercial enzyme product, plus the obligation of always supplying it at the same carefully standardized, uniform potency, calls for accurate analytical potency determinations in the enzyme manufacturer's plant.

Indirect methods must be used for potency assay of enzymes. A measured amount of an enzyme of unknown strength is allowed to act on its substrate under standard conditions (temperature, pH, and the like) for a certain period of time. Then the amount of substrate or new reaction product formed is determined. In this way, the potency of an enzyme may be expressed as "units per gram" or "per milliliter" of the enzyme preparation.

In light of pending legislation concerned with the use of chemicals in foods, we should briefly consider the legal aspects of the use of enzymes in food processing. In the sense of this proposed legislation, enzymes are chemicals—like water, protein, carbohydrate, fat, and all other materials comprising a food substance or living matter.

Legal Aspects

But in comparison to synthetic chemicals (to which the pending legislation primarily refers), enzymes have two characteristics which set them apart from synthetic food additives.

One is that they are made up of natural ingredients of living organisms. The other is that in most instances they perform their function and then are destroyed during the final processing steps—and thus are not present in the finished, packaged food item.

Enzymes, as proteins, are readily denatured and inactivated by the heat of drying, pasteurization, or sterilization by retorting.

If a label statement is required under these circumstances, the enzyme should not be listed as an ingredient. Instead, the statement properly should be: "Processed with (name of enzyme)."

When we consider the strong foothold that glucose oxidase rapidly gained in the food industry and the importance that fungal amylases (now included as an optional ingredient in the Federal Bread Standards) have acquired in the baking field, we may well evince interest in the future of new enzymes in food technology.

New Uses of Enzymes

For one thing, attempts have been made to utilize the germicidal powers of hydrogen peroxide in preventing microbial contamination of food products. Notably satisfactory results have been obtained with milk. And here, without minimizing the contributions of other investigators, reference is especially made to the work performed at the Utah Agricultural Experiment Station[8], where hydrogen peroxide-treated milk was compared with pasteurized and raw milk in the manufacture of Swiss and other cheeses. Also, a recent patent[9] refers to the use of hydrogen peroxide in the processing and canning of milk, further indicating the growing interest in this method.

But it must be pointed out that destruction of residual hydrogen peroxide is an absolute must. For residual peroxide interferes with the propagation of the organisms in the cheese starter culture. However, with the enzyme catalase, now being offered at reasonable cost, complete removal of hydrogen peroxide is easily accomplished after the bacterial count of the milk has been reduced by the action of the peroxide. Highly purified "food grade" hydrogen peroxide, which is now readily available, leaves no toxic residues when it is decomposed, by catalase action, to water and oxygen.

The trend of the cheese industry to move to the southern states, where in truth climatic and other factors unfavorably influence the quality and bacterial count of the milk used, creates additional interest in the application of hydrogen peroxide and the enzyme catalase.

In addition to the peroxide treatment of milk, there are other instances in which a combination of peroxide and catalase treatment may be used for germicidal purposes or for bleaching. In this respect, the treating and bleaching of gelatin offers possibilities.

We are, of course, aware of the necessity to convince Federal and other authorities of the non-toxicity of food-grade hydrogen peroxide and of the harmlessness of the peroxide-catalase process—to which objections likely will be raised as long as convincing proof of non-toxicity has not been submitted.

All told, the future enzyme possibilities remain bright. And we particularly mention them here to stimulate investigations that will contribute to the further advancement of the food industry.

Enzymes are biological catalysts present in all living cells and, being proteins, cannot be synthesized but must be obtained from living matter. Whereas certain enzymes like pepsin and trypsin are extracted from animal glands and others like malt diastase are taken from higher plants, modern methods of enzyme manufacture rely more and more upon microorganisms as producers.

Enzymes have been crystallized and thus prepared in pure form. Here, however, the low yields and high costs of the purifications have relegated such enzymes to specialized uses in expensive research projects.

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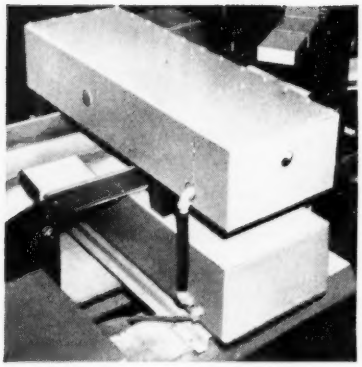

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SAFE REFRIGERATION
in the Food Industry

Big Supermarket Chain Protects Food Quality in Huge New Cold-Storage Warehouse

Refrigerating Equipment Operated with "FREON" Refrigerants

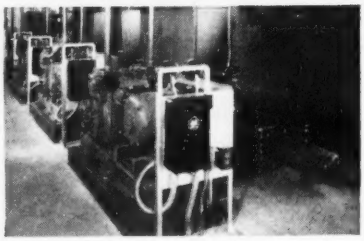
From a single shop 30 years ago, Wrigley's Stores, Inc., Detroit, has become the largest independent food-store chain in Michigan. To handle expanding business and service 60 retail outlets, they recently completed the cold-storage warehouse shown above.

The structure covers more than 390,000 sq. ft. on a 12-acre site and contains 15,000 sq. ft. of refrigeration rooms. These include a meat room large enough to supply all Wrigley stores . . . a freezer room in which 12 carloads of frozen foods may be stored . . . a cheese-aging room . . . dairy-products room . . . cold "dry" room and a cold "wet" room for preserving lettuce, celery and similar foods.

The entire refrigeration system incorporates many advance developments in engineering and was designed by the Detroit Ice Machine Company of that city. For example, air gravity type of circulation eliminates frigid drafts on employees in work areas and reduces freezer burn to stored frozen foods.

Compressors and evaporative condensers in the equipment room are of *Worthington* manufacture operated with "Freon-12" refrigerant. A total of 120 h.p. is used, and any combination of cold-storage areas may be connected to any of the condensing systems. There is ample reserve capacity, and the machines have automatic capacity controls.

Throughout the food industry . . . in processing, transporting, storing and merchandising . . . most modern refrigeration systems now utilize "Freon" refrigerants. They're safe . . . nonflammable, nonexplosive, virtually nontoxic. They are scientifically manufactured by laboratory-controlled methods and their uniform quality further insures the economical, satisfactory performance of refrigeration equipment over long periods of time. E. I. du Pont de Nemours & Co. (Inc.), "Kinetic" Chemicals Division, Wilmington 98, Delaware.



Battery of compressors serving the various cold-storage areas throughout the new, huge warehouse.

Freezer room maintained at -10°F. has 42,000 cubic feet of storage space. Note cast aluminum fin evaporators.

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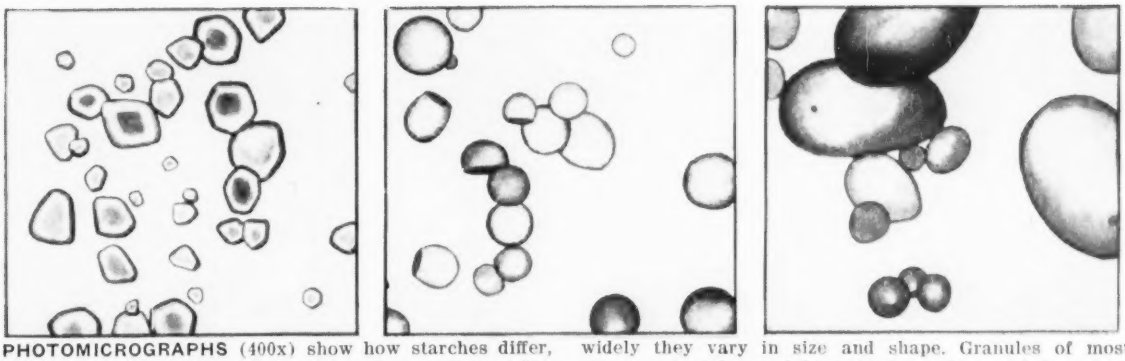


PHOTOMICROGRAPHS (400x) show how starches differ, even though looking alike in dry form. Seen (left to right) are corn, tapioca, and potato starch granules. Note how widely they vary in size and shape. Granules of most starches contain straight-chained amylose and branched-chained amylopectin to give different properties.

Starches Tailormade for Users

What are they? In what way do they differ? How do they improve foods? Are there recommended methods of using them? . . . This article gives the answers

T. A. WHITE

Chief Chemist, General Laboratory, National Starch Products, Inc., New York City

For years, the food industry has been using a few basic starches to improve texture, extend shelf-life, and obtain more appealing products.

Today, the quality of soups, pies, candies, puddings, salad dressings, and the like, are greatly improved with the use of one or more of the modern specialized starches.

Proper selection and use of starch and starch products may mean the difference between success and failure in the quality manufacture of foods.

Starch, a carbohydrate, is extracted from seeds, piths, or roots of plants. It is a white granular powder that is insoluble in alcohol, cold water, and most other solvents. Starch may be cooked with water to form viscous, gelatinous solutions which differ in clarity, texture, and gel strength, depending upon its origin.

In general, dry starches are similar in appearance. But under the microscope (see accompanying photomicrographs*), each granule has a unique shape and size, according to the plant from which it was derived. These granules are formed by linking dextrose molecules to form larger ones, or polymers. The polymers from one plant species differ from those from another.

Basically, two major types of polymers are formed—straight-chained (linear amylose molecules) and branched-chained (amylopectin molecules). The straight-chained molecules contribute short textures and gelling characteristics found in cooked and cooled starch solutions. Branched-chain molecules provide cohesive or gummy properties. Most starches, however, are mixtures of both types.

*Photomicrographs, table, and charts are adapted from *The Story of Starches*, National Starch Products, Inc., 1952.

Important Raw Starches

A number of starches extracted from plants have become of commercial importance in the preparation of foods. These thick cooking raw starches are summarized in our table.

Corn starch, the one most available in this country, is in widest use in food preparation. For years, raw corn starch, in one form or another, has found application in salad dressings, canned foods, confections, as well as for refined brewer's grits.

In Europe, however, potato starch frequently is used for the same purposes. In the Far East, sago starch finds many food uses, while in England it has been used for many years in puddings and custard-like desserts.

Large quantities of tapioca flour are used for food purposes in the Far East and in Brazil. In this country, it has been extensively used in the preparation of a variety of food products such as pies, puddings, and salad dressings.

Arrowroot starch also has been used in this country. Arrowroot cookies have been made here for many years.

Recently, some wheat starch also has found its way into a variety of food products, although at the present time its use is fairly limited.

A relatively new starch, amioca, extracted from waxy maize, is finding acceptance among food manufacturers. It may be interesting to point out that waxy maize is a corn-like grain. This might lead one to believe that extraction of amioca, therefore, would be very much the same as the extraction of corn starch from corn.

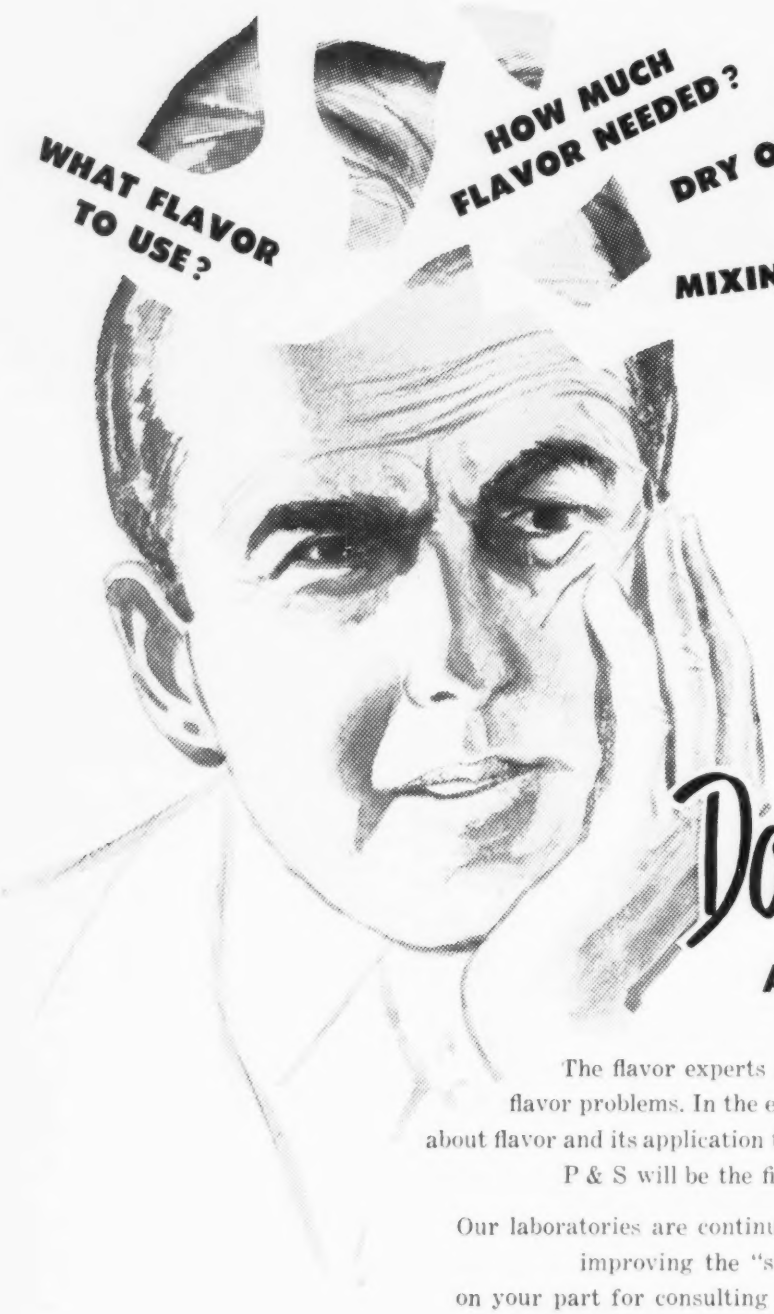
Such is not the case. Cooked and cooled solutions of cereal starches, such as those from corn or wheat, are normally cloudy and they tend to paste, set, or gel. Cooked solutions of root starches like tapioca or potato are generally fluid, cohesive, and non-gelling. But Amioca is the exception among cereal starches, since its solutions remain clear, fluid, and cohesive.

Processed Starches

In many cases, the commercial raw or thick-cooking starches do not have the properties needed by the food industry. Thinner, lower viscosity starches often are preferable, and many applications call for still other properties not possessed by the raw starches. To meet these needs, specialty starches are now being manufactured by procedures that may include acidifying, heating, oxidizing, or other slight chemical treatments.

Thus, confectioner's starch—a thin-boiling corn product—is chiefly used in the manufacture of gumdrops, orange slices, mint leaves, and the like. This starch imparts a soft tender jelly texture to the confections.

Ingredient Special



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Effects of Cooking Time and pH

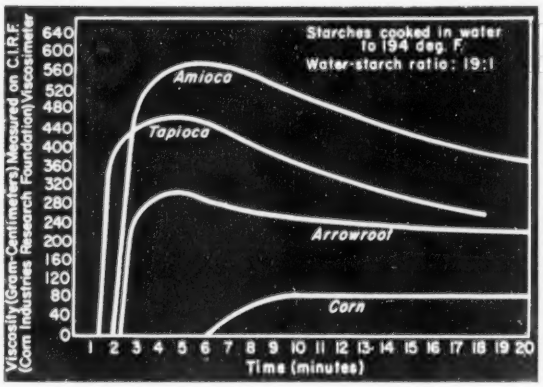

FIG. 1—**COOKING TIME** must be carefully controlled to assure uniform starch solutions with desired properties. Curves show how viscosity of different starches changes during cooking. Granules first swell, increasing viscosity; then rupture, decreasing viscosity.

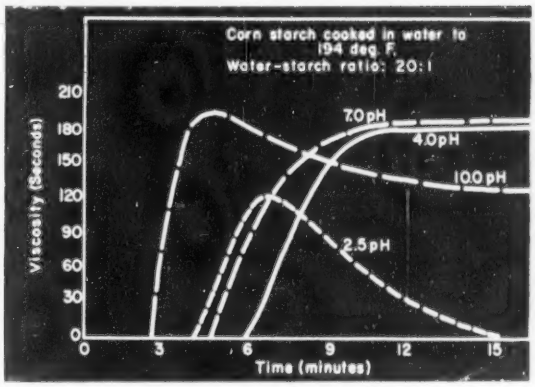

FIG. 2—**pH of STARCH SOLUTIONS** must also be carefully controlled to obtain uniform viscosities. Small differences in pH, from cook to cook, may cause appreciable variations in viscosity. High and low pH cooks break down granules in advance of intermediate pH cooks.

Certain other specialty starches made from amioca or tapioca are highly desirable thickeners or stabilizers in pie fillings. Producing brilliant, smooth-textured fillings with a pleasing, non-cereal taste, these newer tailor-made starches are now finding wider applications.

Sometimes the starch manufacturer must supply starch in a special physical form. Thus, redried starch, a corn product low in moisture, is used in the manufacture of baking powder. Molding starch is another such corn product, this time lubricated with oil or fat. It is extensively used by confectioners to hold an impression into which gum candies and cream centers are cast.

For Improved Products

A few other illustrations will show how progress in starch know-how is helping the food manufacturer improve products.

Canned soups, or cream style corn, for example, require thickeners to obtain desired texture and consistency. Corn starch frequently is used for this purpose, and it is normally supplied to conform with canners specifications on thermophilic organisms—those that resist heat sterilization.

Ordinary starches and flours lose a good deal of their viscosity during normal retort operations. To overcome this, more starch or flour is used, with the result that a cereal-like flavor sometimes is obtained.

Canners are now experimenting with, and some are using, specialty starches which do not lose viscosity during retorting. In many cases, less starch may be used. More important, the canner has better control over processing operations and, at the same time, he can improve his product.

The modern housewife prefers food products that require a minimum of preparation. A constant stream of such new items in pre-mixed or easy-to-prepare form are now being offered.

In recent years, cold-swelling pudding desserts, which do not require cooking, have been added to the list. Such puddings depend, in large measure, upon special pre-gelatinized starch products for their ease of preparation and texture characteristics. These special starches swell and become viscous when heated with water or milk.

For years, the manufacturer of gum-type confection has attempted to cook confectioner's starch in the presence of much sugar and little water. Under such conditions, starch gelatinization is difficult, especially at temperatures under atmospheric pressure. However, at higher temperatures (under greater pressures), it will cook or gelatinize quickly and completely.

A continuous process, based on this principle, is now being adopted by confectioners. And this represents a major forward step for the industry.

The method offers a number of advantages, such as better control over processing, improved product quality, and lower operating costs.

This last example illustrates the importance of careful and uniform handling of starch products. Conditions of application and the type starch being used may, of course, dictate the particular cooking, cooling, and ingredient-adding procedures. In general, uniform processing is the key to consistent success in the use of starch and starch products. Once the conditions of use have been established, handling procedures must be exactly duplicated to achieve uniform results.

Here are some suggestions that food processors should keep in mind when using starches:

1. *Standardize Cooking Procedures.* Even minor variations in cooking may produce non-uniform results. Cooking time and temperature, as well as the intensity of agitation, influence finished food products.

Fig. 1 shows how the viscosity of starch changes as it is cooked in a steam-jacketed kettle. As the temperature of the starch-water mixture rises, the starch granules swell and the viscosity increases until a peak is reached.

Further cooking—even at constant temperature—thins out and breaks down the viscosity of the mixture as the granules rupture. Higher temperatures accelerate the breakdown. Greater agitation will accelerate both

(Turn to page 114)

PHYSICAL PROPERTIES of Some Commercial Raw Starches

Type of Starch	Cell Size (Microns)	Temperatures (Deg. F.) at Which Gelatinization Begins		Starch Paste	
		(5% Solution)	33 1/3% Solution	Texture	Clarity
Corn	10 to 25	176	156	Gel	Opaque
Amioca	10 to 25	165	162	Cohesive	Slightly Clear
Tapioca	10 to 35	145	136	Cohesive	Clear
Sago	15 to 70	165	160	Soft Cohesive	Slightly Clear
Potato	15 to 100	147	142	Soft Cohesive	Very Clear
Wheat	5 to 45	170	140	Soft	Cloudy
Arrowroot	15 to 50	167	164	Soft Cohesive	Slightly Clear

Food Testing and Research

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Services cover product evaluation, plant inspection, quality control, formulae development, research, and specifications. The food laboratory division includes engineering, bacteriology, chemical and physico-chemical testing, psychometric testing, test kitchen, sanitation, instrument design and manufacture.

Specific examples of our services, which we perform for both large and small companies, are as follows:

Packaging

For a potato chip manufacturer investigating packaging materials, we compared numerous types of barrier materials such as cellophane, laminates, metallized papers, waxed papers, etc., for physical properties such as moisture vapor transmission, ultra-violet transmission, protection against rancidity.

After making several changes in his product, a major manufacturer of home canning containers began receiving complaints that his containers did not seal properly under home canning conditions. The Engineering Division of the United States Testing Co. studied thousands of containers for variations in quality and the effect of the changes on the products' functioning. Statistical analysis of the results of this study indicated the need for quality control in the plant to keep variations within closer tolerances.

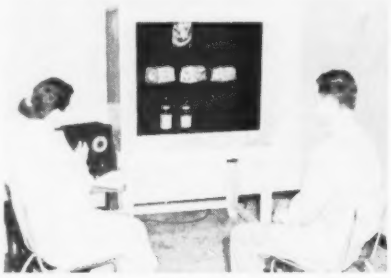
Quality

For a bread manufacturer, we made comparative studies on the physical properties of bread: softness, mildew, pH, and dimensional changes. Object, to ascertain the relationship between the staling and the food processing operations conducted in various plants of the manufacturer throughout the country.

Salad oils were tested to determine their blendability with other recipe ingredients, the crumb texture of baked products made with the oil, and their moisture characteristics.

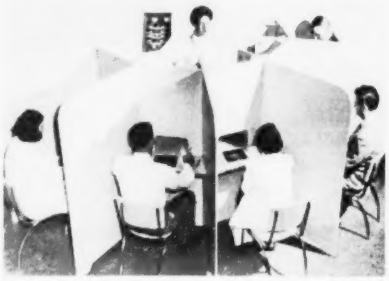
Psychometrics

Psychometrics is a method of testing which employs panels of human beings to evaluate products. The reactions of observers are scientifically controlled and interpreted so that, for the first time, the human element in the quality and flavor of food becomes a measurable factor.



For example, Psychometrics determined which of several candy recipes would be most appealing to the consumer. It revealed the source and importance of contamination resulting from paper, plastic, and other packaging materials; for a large beverage manufacturer, it found that these packaging components contributed to serious off-flavors. It determines whether or not a food is too spicy, too sweet, too bulky, or evenly flavored.

In addition to evaluating a food's human appeal, Psychometrics can measure the sales power of the packaging. It is an effective method of studying legibility, attention value, apparent size, and perceived recognition value of packages and labels.



To illustrate, Psychometrics found that a simple change in packaging color increased the apparent size of certain packages in a food product line very significantly. In another instance, the addition of a neck label was suggested to improve the appearance and add consumer recall value to a jar.

Product Certification

The United States Testing Co. offers to meritorious products a special Certification Program. Under this program the food product is tested on a continuous basis from raw materials through every step in manufacture to packaging. It is sampled on the open market and check-tested regularly. If the food product meets our quality standards, and continues to do so, it is Certified and awarded the Seal of Quality.

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The United States Testing Co. offers a uniform plant inspection plan to the food industry in which plants will be inspected and evaluated on the basis of sanitation and quality control.

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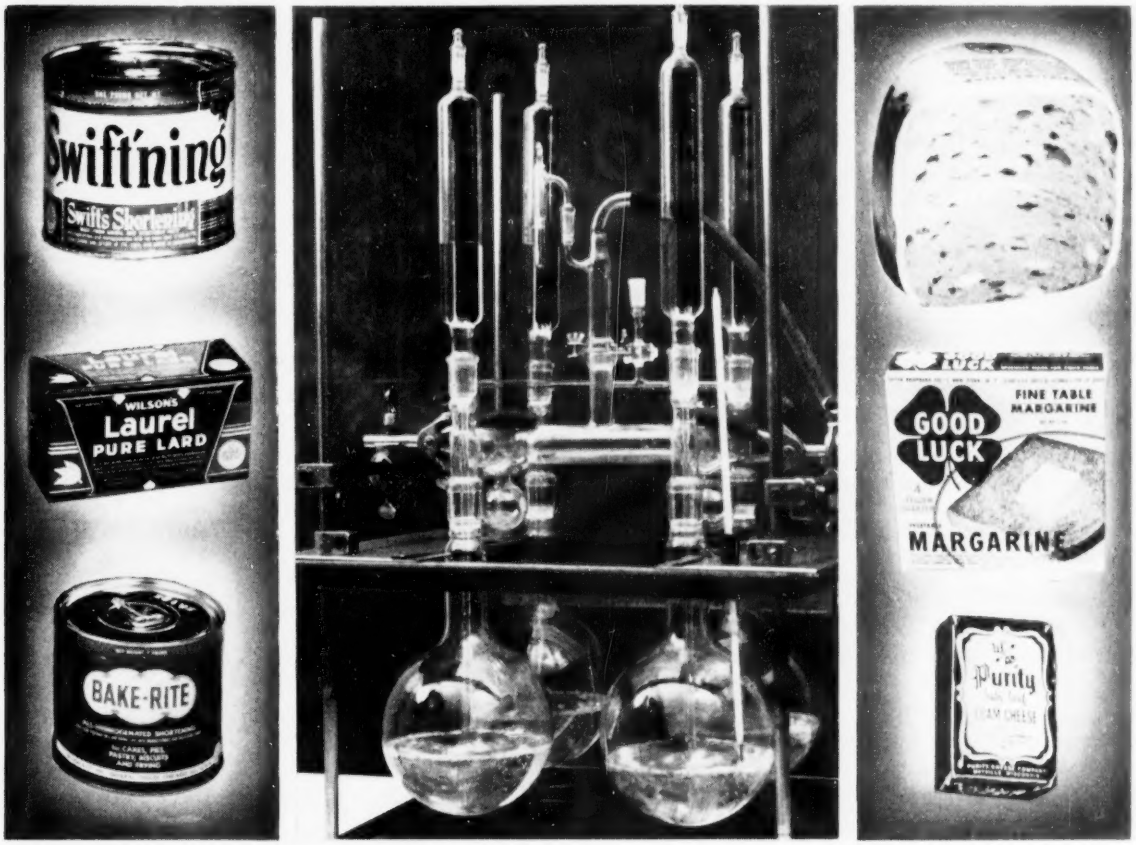

MULTIPLE-SAMPLE units of type shown (center) aid in design of equipment for bettering animal and vegetable fats and thus boost their food uses, such as those illustrated in side panels.

Advanced Food Processing With

IMPROVED FATS AND OILS

1. Factors in Lard's Comeback
2. New Fats That Stay Plastic
3. Soybean-Oil Flavor Stabilized

¶ THE REGIONAL research laboratories of the Bureau of Agricultural & Industrial Chemistry, USDA, continue to devote considerable attention to utilization of animal and vegetable fats to the end that new and better uses will create increased demand for these farm products.

In this research both improved food and non-food uses are explored. In the former, emphasis is on lard, cotton seed, and soybean oils, which are already firmly entrenched in the food field. In the latter, are considered the inedible animal fats and foods of cotton seed and soybean oil which are now available in large quantities at low cost.

These studies, conducted in close collaboration with the industries concerned and their researches, are contributing to technological changes in the food fat field. While much remains to be done, the trend to the new is already apparent, as is reflected by the following reports.

1—FACTORS IN LARD'S COMEBACK

W. C. AULT and R. W. RIEMENSCHNEIDER

Eastern Regional Research Laboratory, Wyndmoor, Pa.

Inclination to regard lard as a raw material completely interchangeable with other fats in the manufacture of shortenings, as indicated by the recent phenomenal rise in its use*, has come about as a result of many years of study of the chemistry of fats and oils.

This research has shown that lard contains essentially the same fatty acids as do vegetable oils and is equiva-

*In the period 1937-41 average annual amount of lard processed into shortening was 16,000,000 lb. In 1947 it was 161,000,000 lb.; in 1950, 177,000,000 lb.; 1951, 206,000,000 lb.; and in 1952 the total may approach 300,000,000 lb.

lent in digestibility and nutritive value.

It has further shown that lard's tendency to become rancid can be overcome in two ways: (1) by addition of edible antioxidants, and (2) by blending tocopherol bearing oils, such as cottonseed, peanut, and soybean, with it.

The latter method is especially beneficial because it permits greater latitude in selective hydrogenation than is possible with lard alone. This makes the process easier to control and, therefore, aids in obtaining the desired physical consistency.

And aside from the technological there are these points: A boost in consumption of the product is seen—which would be most favorable price-wise, considering the recent selling-level disparity, where vegetable oil has at times sold for twice as much as lard. What's more, products made by blending with vegetable oils cannot be called lard—an advantage because of past prejudices regarding lard's rancidity tendencies.

Physical Character Altered

Another important advance in the technology and use of lard can be attributed to the discovery that its physical character can be altered by mild treatment with sodium alcoholates, such as sodium methylate.

Apparently this treatment brings about rearrangement of the fatty acids in the glycerine molecules, although the actual chemical changes have not been completely established.

Lard, in common with many other fats and oils, does not have a strictly random distribution of the various fatty acids on the glycerol molecule.

The rearrangement treatment with catalysts such as sodium methylate causes an interchange of fatty acids between different glycerine molecules, and possibly even an interchange of acids on the same molecule. This interchange is random in character and, if the catalytic treatment produces maximum interchange, the resultant product would have a true random distribution of its glycerides.

The glycerine composition of completely randomized fats can be calculated providing the fatty acid composition is known. The latter can be readily determined by recently improved spectrophotometric methods.

Since the physical character of a fat is dependent on its glyceride composition, changes in this composition as effected by treatment would be reflected by changes in physical properties. Different fats, depending on how much their natural glyceride distribution differs from true random pattern, will be affected to a greater or lesser extent by the catalytic rearrangement.

Such treatment results in a product that has a wider plastic range than the untreated lard—i.e., it is more plastic and workable at lower temperatures and retains its plastic character at higher temperatures. Tendency to become "grainy" in appearance and texture is also reduced.

Makes Better Cakes

Rearranged lard used in cake formulations results in greater volume and lightness than when untreated lard is used.

Side products, such as small amounts of soap and methyl esters formed in the reaction of fats with sodium methylate, and also unreacted catalyst are removed by filtering, washing, and vacuum steam deodorization.

Although exact figures are not available, it is known that substantial quantities of the "rearranged" lard are being used in prepared bake mixes. It is estimated that between 60 and 100 million pounds of shortening are used annually in prepared mixes of all types.

Miscellaneous Uses

Other fields in which meat fats such as lard may find future application are frozen desserts and margarine. These possible uses require further research and development. However, in view of the economic advantage enjoyed by lard over butterfat and vegetable oils, it is logical to assume that a great deal of work is being done to expand its use in these fields.

The ERRL is conducting research, both fundamental and practical, on the chemical and physical changes which take place in fats subjected to various catalytic treatments.

Since knowledge of the changes in fatty acid and glyceride composition of fats is extremely important in this and many other investigations on fats, considerable attention is also being given to development of satisfactory methods for determining these fat compounds.

2—NEW FATS THAT STAY PLASTIC

R. O. FEUGE

Southern Regional Research Laboratory, New Orleans, La.

Two unrelated problems in the food fat field may be solved by new type fats developed through recent research.

One of these problems concerns the need for a plastic, but non-greasy, fat which might be used as a protective coating for food products.

The other relates to the search for an oil which will remain liquid, or at least highly plastic, at temperatures well below the freezing point of water—one which simultaneously possesses a relatively high resistance to rancidity and other forms of deterioration.

Solution of these two problems may be the substitution of acetic acid for a portion of the long-chain fatty acids found combined in certain of the ordinary fats and oils.

Hard Fats Made Plastic

Introduction of acetic acid into a hard fat or stearine, such as is produced by completely hydrogenating cottonseed oil, results in a product which solidifies in a waxy and generally translucent form. The waxiness has been traced to the presence of a specific type of fat crystal which, in acetostearins, is stable for all practical purposes.

Unlike ordinary plastic fats, which are really mixtures of liquid oil and relatively hard crystals of solid fat, these materials can be plastic even though they do not contain a liquid fraction. And unlike ordinary fats, which are hard and brittle when completely solidified, the acetostearins show no marked changes in plasticity with variations in temperature. Some of them can be quite plastic at both refrigerator and room temperature.

Melting points and other properties can be tailored within limits by varying conditions of preparation and composition of the hard fat used as starting material. Products with melting points in the range of 84-130 deg. F. can be prepared. And all have a relatively high resistance to oxidation—those made from hydrogenated cottonseed oil can be aerated at 208 deg. F. for 1,000 hr. without developing peroxides.

With the exception of the unusual properties just mentioned, the acetostearins resemble ordinary fats. Standard methods of purification render them practically odorless, colorless, and flavorless.

New Uses Seen

One of the possible uses for these products would be as a coating for wieners and other processed meats to retard loss of moisture and deterioration. Cheese is another type of food which might benefit from such a coating.

The low-melting acetostearins also have been tested as slab dressings in

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the manufacture of hard candies. Primary requirements here is for an oil that will not become rancid when exposed to the air in a thin film for long periods of time. While these tests have not been completed, preliminary results have shown a large measure of promise.

Raisin and Nut Possibilities

It has been suggested that low-melting acetostearins might be used as non-rancidifying oils to prevent clumping in raisins, and that high-melting ones be used as coatings for raisins to prevent their drying out when incorporated in dry breakfast cereals. It has also been suggested that walnuts and pecans might be coated to prevent development of rancidity.

The problem of finding a stable oil which remains liquid or substantially liquid at temperatures below 32 deg. F. may be solved by chemically incorporating acetic acid in peanut oil, triolein, and other normally liquid oils. With the exception of their low melting points, the aceto-olein products have properties similar to those of the acetostearins and they are prepared in a like manner.

An aceto-olein product made from a commercial oleic acid was found to have a melting point of −11 deg. F. and yet its capacity for reacting with oxygen and becoming rancid was somewhat less than that of general purpose shortening. Peanut oil, in which acetic acid was incorporated, had a consistency of 0 deg. F. equal to that of margarine at room temperature.

3—SOY OIL FLAVOR STABILIZED WITH METAL INACTIVATORS

J. C. COWAN
Northern Regional Research Laboratory, Peoria, Ill.

One of the major problems associated in the food field with use of soybean oil, and shortening made with it, is flavor "revesion" accelerated by presence of small amounts of trace metals such as iron and copper.

Crude "native" soybean oil contains from 0.2 to 1.0 ppm. iron and copper, both of which are pro-oxidants. But commercially extracted oils frequently have 5 ppm. or more of iron. And, although further processing steps may reduce the amounts of metals substantially, sufficient remains to be detrimental to the oil or shortening.

However, there are several methods for minimizing such effects.

An extremely satisfactory one is addition of a metal-inactivating agent such as phytic acid prior to deodorizing. Effects of such additions are indicated in the accompanying tables.

Results with the "crude" sample in the laboratory (Table I) might be considered close to the ideal obtainable without use of an inactivator. The metal does not appear to be active because of presence of phosphatides, known to be inactivators.

Metal Picked-Up In Process

Alkali refining decreased metal content, but bleaching increased it slightly; indeed, enough in these carefully conducted tests to be significant. Deodorization again increases metal content unless special equipment is used. Studies show that 0.1 and 0.01 ppm., respectively, of iron and copper substantially lower both oxidative and flavor stability of soybean oil. When a metal inactivator was used during deodorization, initial flavor and aged flavor were definitely superior, and oxidative stability was greatly improved over the sample deodorized without inactivator.

New multi-effect deodorizers constructed of stainless steel or nickel have produced improved soybean oils. Without added inactivators, initial flavor scores can be considered good, but these products do improve the flavor and oxidative stability, as shown in Table II.

If initial deodorization had been done with a metal inactivator, a better flavor might have been obtained. Indeed, pilot plant studies have shown that flavor scores as high as 9 can be obtained when phytic acid is used.

In the case of commercial shortenings, it appears that initial flavor, aged flavor, and oxidative stability could be further improved by additional use of metal inactivators (see Table III).

Characteristics Desired

Many compounds are now known to be active as metal inactivators. They improve stability of other vegetable and animal fats as well as soybean oil.

In general, these are phosphoric acid derivatives such as phytic acid, or have structures capable of readily forming 5- or 6-member stable chelates with a metal such as iron or copper.

A representative formula for such a compound might be written: $X(CH_2 - Y)_n$ where X is a coordinating group or atom such as sulfur, oxygen, or nitrogen; Y is an acidic group that will form ionic bonds with the metal; and n is two or more.

Thiodiacetic acid is a good example. Here, X is sulfur and Y a carboxylic group. Carboxymethylmercapto succinic acid is another example which has excellent inactivating characteristics, but does not have particularly good heat stability.

Stability and flavor have limited the usefulness of some materials, but studies are expected to lead to heat-stable, fat-soluble metal inactivators of high activity.

TABLE I—METALLIC IMPURITIES and Metal-Inactivating Agents Influence Flavor Stability of Soybean Oil

Sample	Metallic Content		Flavor Scores		Peroxide Values
	Iron Ppm.	Copper Ppm.	Initial Sample	Aged Sample	A.O.M. Conditions 8 Hr.
Crude[1]	2.6	0.14	8.6	7.4	10
Alkali Refined[1]	0.05	0.005	8.3	6.3	17
Bleached[1]	0.057	0.025	7.9	4.7	50
Deodorized[2]	1.5	0.026	5.0	3.5	69
Redeodorized[1]			6.5	3.4	80
Deodorized with metal inactivator[2]	0.22	0.01	8.1	6.4	4

[1] Laboratory processing. All samples tasted after complete refining and deodorization.
[2] Commercial deodorization.

TABLE II—INACTIVATORS Improve Flavor and Oxidative Stability of Soybean Oils Deodorized in Stainless or Nickel Units

Sample	Flavor Score		Peroxide Values
	Initial	Aged 4 Days 60 Deg. C.	A.O.M. Conditions 8 Hr.
Deodorized in new unit	7.2	5.2	26
Deodorized with metal inactivator	7.1	6.1	6

TABLE III—FLAVOR and Oxidative Stability of Hydrogenated Soybean Oil Are Significantly Improved by Addition of Phytic Acid

Sample	Flavor Score		Peroxide Value
	Initial	Aged	A.O.M. Conditions 72 Hr.
Without phytic acid	3.4	3.6	314
Phytic Acid (0.01%)	6.8	5.6	11

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FE STAFF

Food manufacturers are giving more and more attention to the uses of a class of materials called stabilizers, basic functions of which are to thicken, suspend, gel, or emulsify.

They range from the ancient gum arabic through the synthetic methyl celluloses to the commercially new gum guar.

Each exhibits its own distinguishing characteristics, some useful, some detrimental. In order to take advantage of the good properties of any one, a second or third can be added to offset some of the drawbacks.

The materials fall into three broad classes: (1) Natural gums such as locust bean and seaweed extracts; (2) synthetic gums such as carboxymethyl cellulose; (3) others such pection and gelatin.

Within these divisions, additional classifying properties become apparent. Some of the gums merely swell in water, while others dissolve. To be effective, some require heat, others work in the cold. There are those that can be made to gel chemically, such as algin combined with calcium salts, or Irish moss extract with potassium chloride. Others, like locust bean gum, are unaffected by any edible compounds.

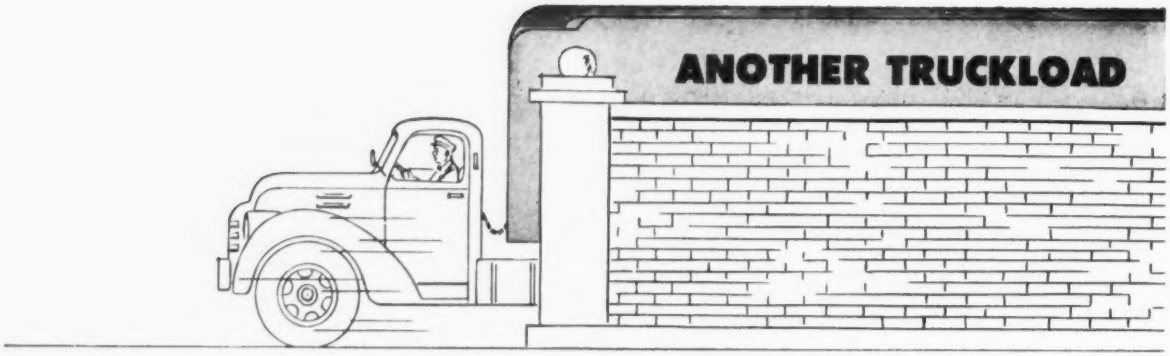
The following review, by type of food product, shows the wide range of applications of the various stabilizers.

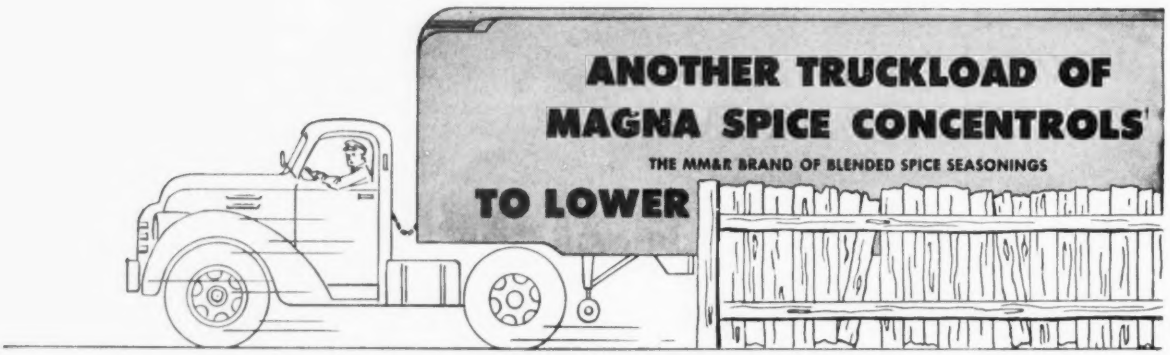
NECESSARY IN FROZEN DESSERT

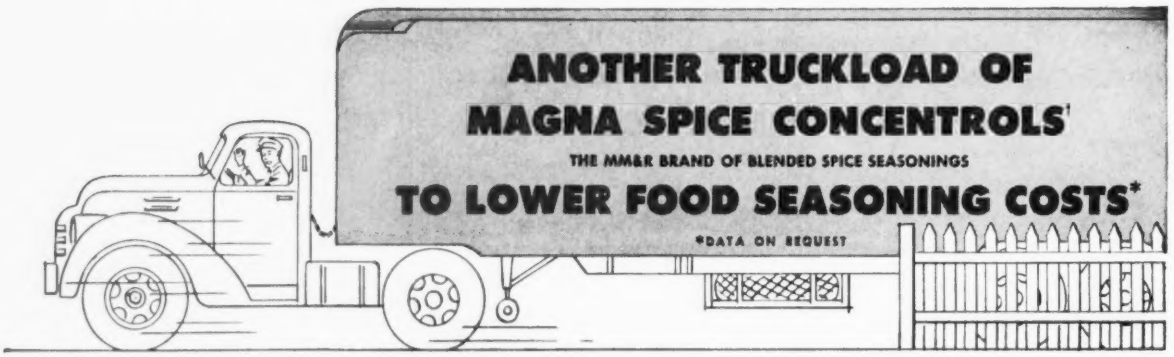
Present application of stabilizers in frozen products is confined primarily to ice cream, ice milk, sherbets, ices, and vegetable fats based desserts. They are used for the same purpose in all types—to promote smoothness by inhibiting growth of ice crystals, give the product more body or chewiness, and increase the resistance to heat shock.

Gelatin was probably the first widely used stabilizer for frozen products. It gives a fast, smooth melt down, but is low in heat shock resistance. Also, the mix requires aging for at least 4-6 hr. before freezing. Level of use of gelatin varies with Bloom strength, but averages 0.3 percent based on weight of mix. It is put in before pasteurization. When mix is to be flash pasteurized, gelatin is heated in water, then added to the ingredients prior to pasteurization.

Locust bean gum has also had a fairly long usage. It provides a chewy ice cream with slow melt down and good heat shock resistance. This gum causes the mix to separate, or whey off, so it must be restirred before freezing.



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This separation may be overcome by adding a small amount of Irish moss extract along with the locust bean gum. The patent covering this combination notes that Irish moss reacts with the milk protein to increase mix viscosity to the point where separation does not occur.

Locust bean gum is used at about 0.12 percent of the mix, and the Irish moss at about 0.015 percent. Standard strength mixtures of these gums are commercially available. They are added to the mix before heating.

Several widely used stabilizers have carboxymethyl cellulose (CMC) as the primary active ingredient. This also tends to separate the mix, and blends with Irish moss are available to control this condition. The stabilizer should be added to the mix prior to heating. Since CMC is soluble in the cold, it is finding some use for flash pasteurized ice cream mixes.

Another widely used gum is sodium alginate, a seaweed derivative. It produces an ice cream that is smooth, shows good heat shock resistance, and has good melt down properties. Here, amount used is quite critical, since a small excess causes high viscosity, particularly in chocolate mixes. About 0.09 percent is employed, along with buffer salts. Sodium alginate reacts with the calcium salts in the mix, therefore must be added at 160 deg. F.

For Flash Pasteurizers

The newly available guar gum is the base for a product intended primarily for use in flash pasteurized ice cream mixes. This gum is cold swelling, and is available in a blend with Irish moss to prevent whey-ing off. The patented mixture has not been employed long enough to permit a critical evaluation. Rate of use is about the same as with locust bean gum.

Irish moss extract finds some use by itself as a stabilizer. Disadvantage is the high viscosity imparted to a mix by relatively small amounts of the gum. This small amount (about 0.03 percent) gives a product that some ice cream men consider understabilized, though its users like the fast melt down and not-too-chewy nature of the product.

Several stabilizers are especially intended for ice milks to be used for making malted milks at fountains. The frozen product must have easy dipping properties, give a large volume of malted milk with good viscosity, and a stable foam. One of these stabilizers contains six gums.

In the manufacture of sherbets and ices, pectin based stabilizers are most popular. As a rule, locust bean gum is blended with the pectin to promote smoothness. Use of this gum alone gives a more crumbly product than the above combination. Heat is essential for these stabilizers to be effective, though full pasteurizing time is not necessary—a 5-min. soak in 180 deg. F. water is enough.

Most ices-on-a-stick are stablized with gum karaya, an inexpensive cold swelling product. It is of little value in ice cream.

Packaged, powdered mixes to be made into frozen desserts at home are mostly stabilized with CMC because of its cold soluble property.

In general, all of the stabilizers show a tendency to lump when added to liquids. They are best handled by dry mixing with sugar. Since many of the commercial products already contain sugar, they can be added directly to the mixes if agitation is good.

SUSPENDS FLAVORS IN LIQUID

One of the largest single uses of Irish moss extract is in the preparation of chocolate milk. The extract reacts with protein in the milk to form a slight gel, thus increasing viscosity and causing cocoa fibers to remain suspended throughout the drink. Most dairies now use prepared chocolate powders, these being added to the liquid before heating. They contain cocoa, flavor, and Irish moss. Amount of moss used is 0.03 to 0.04 percent based on weight of milk.

For producers who prefer to concoct their own combinations, standardized blends of Irish moss extract and sugar are available. Amount of moss used must be confined to a very narrow range, since too little permits cocoa settlement, while too much gels the liquids into a near-pudding consistency.

Chocolate Syrup, Beer, Dressing

The same types of Irish moss are used to make chocolate syrup for fountain toppings. The gum gives a smooth creamy body, prevents cocoa from settling to the bottom of the container, and helps keep the cocoa fat emulsified so no ring forms on top.

Gums find their way into brewing, too. A special Irish moss is used in clarifying beer in the wort kettle, and gum arabic is used as a foam stabilizer.

French dressing has long been emulsified and thickened with gum tragacanth. Recently, special Irish moss extracts and propylene glycol alginate have been found good for the same purpose.

A recent patent covers the use of gum guar and locust bean gum as a "cloud stabilizer" in citrus drinks. The concentration is only about 50 ppm. in the finished drink, which gives no measurable increase in viscosity.

Tips on Use of Gums

★ When adding gums to a liquid, mix them with one of the dry ingredients of the formula—sugar is one of the best dispersants.

★ Don't make too concentrated a solution. Viscosity develops quickly, and the batch may burn on to the kettle.

★ Overstabilization is as bad as understabilization. The overstabilized product is gummy and tough, and the flavor may be masked. It takes only a small amount of stabilizer to do a good job.

GIVE EYE APPEAL TO BAKED GOODS

Water-holding capacity of several of the gums makes them useful to the baker. Though most fruit pie fillings are made of starch, many bakers consider a non-running all-starch filling too pasty to meet their requirements. By combining gum and starch, it is easy to get a good eating filling that is not liquid or runny when the pie is cut.

Most frequently used is a combination of locust bean gum and Irish moss extract. This gives a filling of good clarity that does not mask color or flavor of the fruit pieces.

In general, only about 20 percent as much gum stabilizer is required as is starch in a pie filling. Complete replacement is not good practice if the filling is to be baked. For the gum filling is thinner boiling and may cook over in the oven. Up to one-half of the starch can be replaced with gum type stabilizer. This combination produces a good eating filling without a pasty taste.

The same gums can be used alone for fruit tarts where sparkling clarity and easily visible fruit is an important selling point. Since the shell is prebaked, the thinner boiling

character of the stabilizer-containing filling is unimportant.

Combinations of starch and gums are being used very successfully for "pail" fillings. They show less tendency to crack, crust, and dry out than do straight starch fillings.

In custard pies, Irish moss is used to some extent as a starch replacement. Since the moss gels when heated with milk, use of about one-third of a percent (based on the liquid milk) will produce a firming effect without toughening. It is necessary to heat the milk and moss to about 160 deg. F.

Toppings, Icings, Too

Almost all meringues are now made with some type of stabilizer. The whip is stiffer and drier, and it shows much less bleed than an unstabilized topping. This makes for a dry, attractive meringue when cut, and eliminates the water layer between filling and topping. Two percent (based on the water used) of algin, Irish moss, agar, or locust bean gum is a good starting point. Available are several combinations of these gums which give good protection. They are mixed with part of the sugar and water, brought to a boil, and slowly added to the beaten egg whites.

Cold soluble meringue stabilizers are offered, but they are not as effective as those requiring heat. These are put in water, stirred in, and added to the beaten whites.

Gums are well suited to preparing baker's jellies. Either real or imitation fruit jellies can be made with a wide range of sugar concentration and pH. Based on the liquid, 1 to 2 percent of Irish moss extract, agar, or algin can be used. There are also available good mixtures of locust bean gum and Irish moss.

With growth of packaged baked goods there arose the problem of sticky icings. Where the cellophane pressed against the icing, a bond was formed, and when the wrapper was removed, the icing lifted off the cake. Here again, gums—Irish moss extract, algin, agar, gelatin, and locust bean gum—are used. About one-half of one percent (based on the liquid) is usually sufficient. With the exception of algin, all must be heated. However, since most large bakers use hot or boiling water to prepare flat icings, this factor is of limited importance.

APPLICATION IN CANDYMAKING, MEATS, PUDDINGS, AND CHEESES

Gum type stabilizers find their largest confectionery use in jelly pieces. Here, modified pectins are preferred because of the longer shelf life of the candies as compared to starch pieces. They show less toughening and less "sweating" under high temperature and humidity. Agar still finds some use, but is more expensive and subject to wide price fluctuations. A number of special compounds of Irish moss have been tried, but none is in large commercial use.

Small amounts of stabilizers are incorporated with soy protein whipping agents which find some use as an egg albumen substitute in nougats and frappes.

Then again, gums are finding applications as so-called "meat binders" used in the manufacture of sausages and meat loaf to bind the added water to fat so that it does not form unsightly pockets during and after heat processing. Cereal products and skim milk powder have long been used, but newer additions are Irish moss extract and karaya.

Sugar-free jellies, starch-free puddings, and other low carbohydrate (dietetic) items, are made with setting or gelling gum combinations such as Irish moss and algin plus proper salts.

Federal standards of identity permit the addition of a number of gums to cheese, provided the level is not more than 0.8 percent of the finished product. In cream and cottage cheese, gums cut down on weeping, and give a better body with a creamier texture. Gums are used in cheese spreads to prevent weeping in the jar, thereby extending the shelf life. Most widely used is locust bean gum. However, some manufacturers are using a combination of locust bean gum and sodium alignate. Stabilizer must be added before proceeding with heating of the batch.

Irish moss has been found useful as an additive in starch puddings. The amount of starch can be reduced and setting quality maintained by putting in about 0.2 percent of moss based on the liquid to be used. This gives a pudding of improved eating qualities due to a less pasty nature. It also lessens the tendency for a skin to form when puddings are held overnight before eating.

Newest entry in the pudding field is the instant or unheated pudding. These are not gum based, but are composed of pre-gelatinized starch, either waxy maize or tapioca being used at present.

Role of Phosphates

—*Continued from page 70*

prevent caking during storage but also to effect an even distribution when these products are blended with other materials. Tricalcium phosphate is also used, for the same reason, in other products which tend to become sticky when exposed to atmospheric conditions.

Much has been written about the synergistic action of phosphoric acid with tocophoral in imparting antioxidant properties in fats and oils. And residual or added polyphosphates have also been regarded as having synergistic effects, possibly because of their reaction with and removal of metallic ions.

No mention has been made here of the auxiliary uses of phosphates in processing operations, such as the treatment of water or achievement of sanitation in food processing establishments. Enough has been said, however, to indicate the extensive part that is played by phosphoric acid and its salts in contributing to the nutritional value, the variety, the keeping quality, and the good-eating characteristics of stable American Foods.

End (*Resume reading on page 71*)

Corn Sweeteners

—*Continued from page 76*

serving ability at equal concentrations to sucrose. This effect is due to the difference in the osmotic pressure of the two sugars, dextrose having about twice the osmotic pressure of sucrose at equal concentrations. This characteristic is significant in canned pears, where dextrose-containing packs have less tendency to sloughiness than the 100-percent sucrose pack. The same has been noticed repeatedly in the case of grapefruit sections. The higher osmotic pressure of dextrose is used to advantage in sweet pickle and maraschino cherry production.

Largest food use of dextrose is in the baking trade. In addition to the economic advantage, it is deemed by many bakers to give better crust color and flavor. It seems to trigger the utilization of maltose derived by the enzymatic degradation of the wheat starch.

Most bakers use from 50 to 100 percent dextrose in bread. There appears to be little difference in fermentation time between dextrose and sucrose in actual commercial practice. Consumer panels have indicated no

(*Turn to page 112*)

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Ingredient Special

specific preference for bread made from dextrose, sucrose or corn syrup.

Major advantages of dextrose used in combination with sucrose in the canning industry are lower ingredient cost, better fruit flavors, better physical appearance, and in many cases better natural color retention.

In dry packs, such as pork and beans, dextrose may be used in limited quantities to control color formation of the baked products.

Dextrose has found wide use as a carrier in meat seasonings. Similarly in summer drink powders it is employed as a flavor carrier.

It is an important ingredient of practically all pudding powders, gelatin desserts, and similar dry mixes. Here, the flavor-carrying plus less sweetness are favorable factors.

Finally, dextrose, as such, is frequently used in infant feeding, and it is also an important primary ingredient for intravenous feeding.

End (Resume reading on page 77)

Whipping Emulsification

—*Continued from page 77*

displaced the natural fats, lard, and butter, as cake shortenings.

Hydrogenated vegetables oil shortenings, when creamed with the sugar or flour of a cake formula, took on the air necessary for a light cake and could then be dispersed in the eggs and milk of the formula. The finished batter had its air bubbles dispersed in the fat —in turn dispersed in batter.

Emulsifiers for cake work were first used in the emulsifying type shortenings promoted in the early 30's. Partial glycerides added to the shortening permitted the use of higher ratios of sugar, fat, and liquid to flour, and made larger, lighter cakes.

These emulsifiers served to disperse the fat much more uniformly throughout the batter, but the necessary air bubbles were fewer and still imprisoned in the fat. The critical ingredient was still the shortening, with its crystal structure or plasticity. Shortenings had to be used at temperatures near 70 deg. F. and any adverse temperature history was enough to impair their effectiveness.

The introduction of the whipping emulsifiers in the middle 40's radically changed the above picture. When Vanade was used in any of the above batters, the shortening was just as well dispersed throughout the batter, whether or not it was hydrogenated. But air bubbles were now found in the water phase of the batter and were, therefore, even more numerous and uniformly dispersed than when they occurred in the fat phase.

The method employed with oils or soft fats often involves creaming the chilled fat with an equal amount of sugar, adding the remaining dry ingredients with part of the liquids, mixing vigorously, and then incorporating the remaining liquids, and mixing to obtain a proper blend.

Creaming a batter with hydrogenated shortening, on the other hand, is much easier. Generally, the fat, all dry ingredients, and a small amount of liquid are mixed to insure complete dispersion of the fat. Liquids are next added and vigorously mixed in to obtain a viscosity suited to best aeration. Then the remaining liquids are introduced for proper balance.

Liquid-Shortening Method

This method of making cakes, already adopted by over 40 bakers, depends on the emulsifier for aeration on the batter before addition of liquid shortening. Then shortening levels are selected for the eating qualities.

Aeration of the batter is accomplished prior to addition of oil by using a whipping emulsifier. The same quantity of shortening, however, is required to impart good eating qualities.

Batters made in this manner take on air so rapidly that the mixing time can be cut to ½ or ¼ of the customary time. And oil poured into the aerated batter disperses so readily and finely that only a few seconds of mixing are required after addition of shortening.

Baking tests were carried out using the following formula for rich yellow layer cake (proportional figures by weight): Flour, 100; sugar, 140; fat, 40; non-fat milk solids, 14; salt, 3; baking powder, 5; water, 95; whole eggs, 60; and Vanade, 3. The latter is a whipping emulsifier—a liquid dispersion of sorbitan monostearate with a small amount of polyoxyethylene sorbitan monostearate.

This formula was used in the preparation of the ten high-sugar yellow cakes illustrated at the beginning of this article. Cakes No. 1 to 5 in the first photo were prepared by the conventional mixing method, whereas the whipping emulsifier, Vanade, was employed in cakes No. 6 to 10 (second photo). Only formula difference in these cakes was the type of fats incorporated. They consisted of salad oil, butter, lard, regular shortening, and emulsifying shortening—the last four were in plastic form.

To produce maximum aeration, cakes No. 1, 2, and 3 were mixed according to a commonly employed sugar-shortening creaming method for the softer fats. Batters for cakes 4 and 5 were prepared by a quick-mix method widely used for hydrogenated shortenings. Total mixing time, including a 7-min. aeration, was about 15 min. for these five cakes.

Cakes No. 6 to 10 were mixed 5 min. by the liquid-shortening method. Here, the batters were aerated with Vanade. After 2 min. of aeration, salad oil or one of the other four fats—lard, butter, regular shortening, or emulsifying shortening (in melted form)—was poured into the batter, which was then mixed for 15 sec.

Results indicate that all five fats are suitable for cake baking, provided a whipping agent is employed to promote aeration of the batter (see cakes No. 6 to 10). Cakes No. 1 and 3, which were prepared from batters containing salad oil and plastic lard and no whipping emulsifier, produced baked goods too low in volume.

In brief, whipping agents can now be feasibly employed to aerate cake batters, while liquid or plastic shortening is added for best palatability.

End (Resume reading on page 78)

Natural Spices

—*Continued from page 80*

scheduling purchasing as closely as possible to volume of use is practical. This is not a difficult matter, since it is possible today to buy natural spices economically in almost any quantity —from 25 to 200 lb. containers. Considering the dividends it gives in finer flavor, it is only good business.

No matter how closely the processor gages his purchasing he will have to do a certain amount of storing of his spices. During this period he should keep them in a cool, dry, dark area. Production rooms are no places for spice storing. In most plants they are too hot, too damp, or both. Spices are not tricky or tough to handle. But like anything else they will not produce as well when abused.

Here is a checklist of other ideas which, depending on the type of operation involved, can improve a processor's spice storaging:

1. **Palletizing—especially if there is any risk of water on the floor.**
2. **Date-of-arrival marking and rotation of stock.**
3. **Arrangement of stock so there are air spaces between containers for control of humidity.**
4. **Keeping spices away from outside walls—they are usually the dampest spots of a room.**
5. **Instructing employees to keep spice containers sealed.**

End (Resume reading on page 81)

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Better Pectins

Continued from page 73

concentrations of low methoxyl pectin, kelp-, and Irish moss-extractives. Colloids were added with dry sugar and in a 60 percent sugar syrup.

Appearance, firmness, and percent drained weight of berries were improved by packing in colloid-containing syrups. With dry sugar packs, results were erratic and inconsistent. About 0.15 percent of berry weight of the pectinate increased drained weight of syrup-packed samples as much as did 0.3-0.4 percent of the other additives.

Miscellaneous Food Uses

Although the preserving industry, the confectioners, and the pharmaceutical firms employ the majority of the several million pounds of pectin produced yearly in this country, many other food uses have commercial significance.

A rapidly expanding use is in the preparation of canned fruits and berries for dietetic purposes. Although pectin gives nearly the same caloric effect upon digestion as does sucrose, it imparts a desirable body and viscosity to juices at a very much lower concentration. Pectin, along with a non-nutritive artificial sweetner, is being utilized extensively in preparation of bottled soft drinks for use where a low caloric intake is of prime importance.

Pectin has applications in certain food emulsions. Salad dressings and essential oil emulsions for flavoring are examples. The amount needed for oil-in-water emulsions varies directly with water content, hence pectin becomes of economic interest in high-oil emulsions where relatively small amounts are required.

Solutions of pectin have been used for bakery glazes and for glacé treatment of fruit slices. Pectinate films have been suggested for food coatings. Pectin acts as a cream-whipping aid. It can be mixed with malted milk powder to give greatly increased viscosities in malted milk beverages.

Casein is precipitated from fresh milk when about 0.3 percent pectin has been added. Casein so precipitated is said to be quite easily redispersed and more digestible than that separated by other processes. Consequently it finds application in the preparation of certain types of cheeses.

Many millions of individual units of canned fruit cocktail gels, prepared with low methoxyl pectin, were used by the military forces during World War II. There are many unexplored possibilities in specialty foods of this kind where gels are desired and yet added sugars cannot be used and where a carbohydrate-like gel former is essential.

End (Resume reading on page 74)

Tailormade Starch

—*Continued from page 97*

gelatinization and breakdown, even at constant temperature.

2. *Cooling Important.* The fact that heat is no longer being applied to the kettle does not mean that the hot starch has stopped cooking. After completion of the required cooking schedule, it is important to be quick in lowering temperature below 160 F. to avoid further starch breakdown.

Agitation should be carefully controlled and the solution uniformly cooled. Identical starch pastes, stirred for different lengths of time or with varying amounts of agitation during cooling, will have different physical properties. A starch paste that has been continuously stirred during cooling will be more stable, smoother in texture, and have less of a tendency to set or gel than one not stirred.

3. *Addition of Other Ingredients.* Type of ingredients added to the cook and the order of this procedure is as important as time, temperature, and agitation. Most starches gelatinize more rapidly at higher and lower pH values. At intermediate pH's (4 to 7), gelatinization and breakdown take place much more slowly. The ingredients used may step up or slow down gelatinization and subsequent viscosity breakdown depending on how they affect the pH of the cook.

Effect of different pH values on gelatinization and breakdown is shown in Fig. 2. Here, a series of viscosity values are plotted against cooking time for preparations having different pH values. Note that at higher and lower pH values, both the peak viscosity is reached and the breakdown starts several minutes in advance of starches having intermediate pH values. Even small variations in pH, from batch to batch, may cause viscosity differences.

Thus ingredients that affect the pH of a product may step up or slow down the gelatinization and subsequent breakdown of the starch.

For example, in the preparation of starch pastes for salad dressing, starch is usually cooked with vinegar. If good body and textures are to be obtained, cooking and agitation must be regulated to account for the lower pH from the acid. As noted, starch then gelatinizes more rapidly.

But certain ingredients, such as sugars and fats, also affect gelatinization without influencing the pH of the solution. They retard gelatinization and breakdown by interfering with the proper swelling and clearing of the starch granules. Sometimes better results can be obtained by completely gelatinizing the starch before adding the retarding-type ingredient. This practice is not always possible in preparing food products. But wherever it can be worked in, better product textures and longer shelf-life can be obtained.

Weeping. Any discussion of cooking starch and the effect of ingredients on the final product should include some mention of "weeping"—(syneresis, or the giving up of water by starch pastes or food products on standing). At the same time, the viscosity or consistency of the paste may drop, sometimes quite suddenly, as the result of what is often termed jelly collapse. Weeping is generally the result of using an unstable starch, undercooking the starch or food, or overcooling or freezing the product.

Such weeping is a serious matter in those food products which must have a long shelf-life. For example, canned puddings or custards which contain fats or other ingredients that can interfere with the proper cooking of the starch may become watery upon prolonged standing.

It is interesting to note that cereal starches and flours give more trouble in this respect than do the root types. Root starches and amioca gelatinize more rapidly and hold water more tightly. Used with cereal starches, they may even exert a stabilizing effect that reduces weeping.

Cleanliness. No consideration of handling starches is complete without some word on cleanliness. Cooked starch solutions, especially if warm, will support the growth of bacteria. Food processors, therefore, should observe the highest standards of sanitation to obtain best results. Starch pastes (alone or admixed with other ingredients) which accumulate in crevices or piping systems may contaminate a whole batch. However, the good sanitary measures, taken wherever food is being processed, will be satisfactory for starch solutions.

This discussion of the uses of starches in the food industry is the beginning and not the end of any processor's attempt to familiarize himself with the possibilities and problems involved in adapting starches to his product requirements. Each process and product has its own peculiar problems.

End (Resume reading on page 99)

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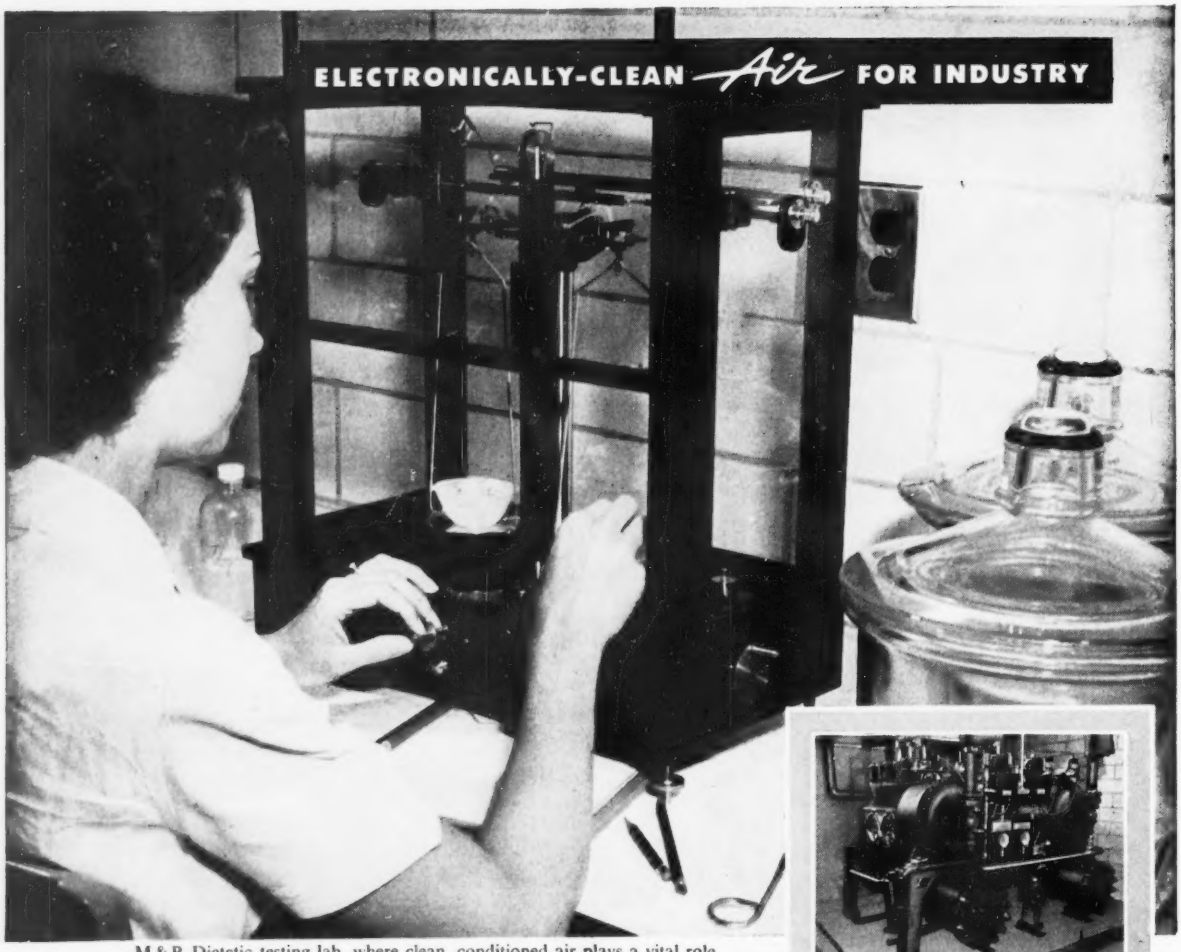

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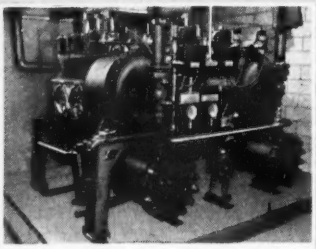

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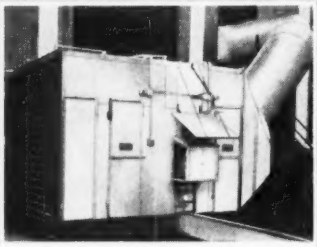

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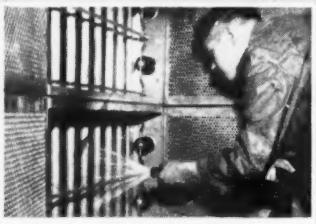

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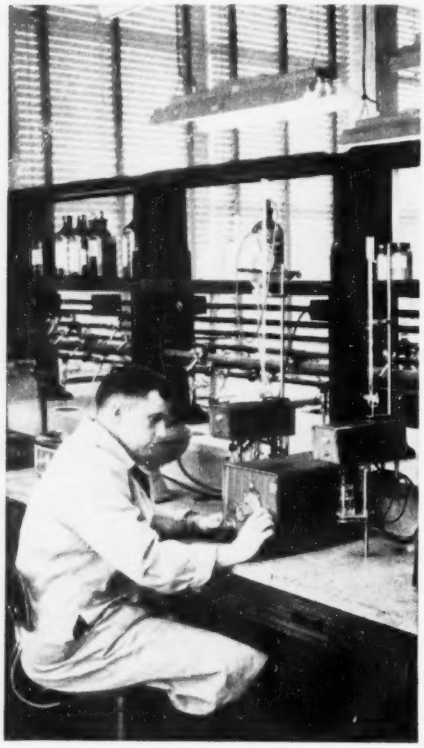

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And, of course, a food packaging material must not contain any materials unsafe for use in contact with food. Here again, Glycerine is the ideal answer. It has a long-time record of acceptance, not only in food wraps, but in food products themselves. In fact, it has food value in its own right.

Applications of U. S. P. Glycerine in food processing—as a humectant, sweetener, solvent, plasticizer—have been accepted by the American Medical Association Council on Foods, and permitted by Federal and State food and drug authorities.

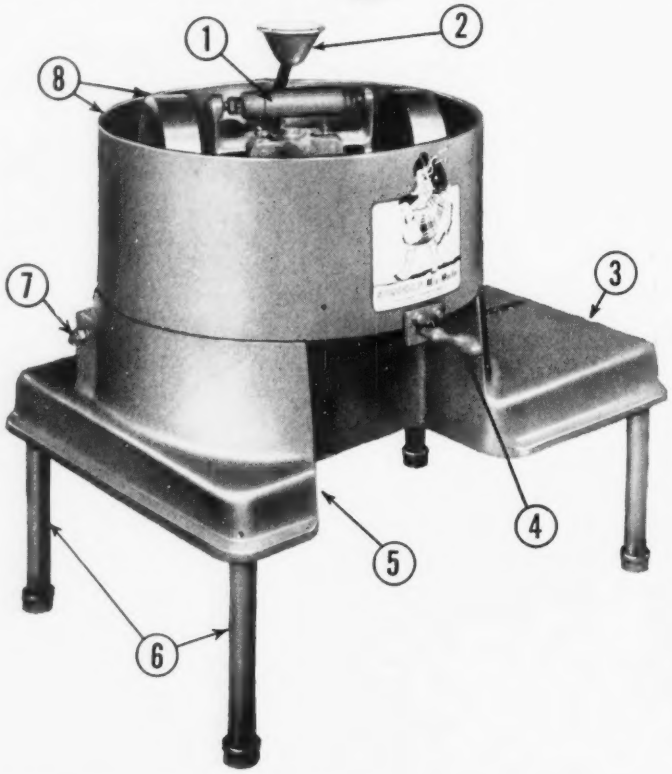
For a copy of "Why Glycerine for Foods?" a handy 16-page booklet on Glycerine's unique range of properties and applications, write Glycerine Producers' Association, 295 Madison Ave., New York 17, N. Y.

Nothing takes the place of Glycerine

For more information, use coupon on page 201.

Here's your modern "Mortar and Pestle" for accurate laboratory mixing

The *NEW* SIMPSON LF *MIX-MULLER*



1. SPRING-LOADED MULLERS . . . designed to exert more or less pressure, as adjusted. Mullers weigh only 30 lbs. but can be adjusted to exert up to 80 lbs. pressure.

2. ADDITIONS FUNNEL — DUST COVER . . . arranged so the funnel directs liquid additions *directly* to the material bed — without removal of dust cover or splashing of liquids. Tight fit of light spun-metal cover assures dust-free operation. (Hood not shown in photo.)

3. WORKING AREA . . . integral casting of mixer and motor base provides adequate working area for tools or other laboratory appliances . . . also assures proper and permanent alignment of drive.

4. CIRCULAR LEAK PROOF DISCHARGE DOOR . . . machined for tight fit and smooth operation. Large door, clear space provides for quicker discharge of batch.

5. V-BELT DRIVE — TORQUE ARM REDUCER . . . completely yet accessibly enclosed beneath base plate. V-Belt drive assures flexible operation . . . and easier, lower maintenance. Vertical mounted motor is readily accessible for maintenance or removal.

6. REMOVABLE OR EXTENDABLE LEGS . . . standard legs are 12" long to provide a 33" desk high working height. The legs may be removed for table or other mounting . . . or extended to fit individual needs.

7. TORQUE ARM ADJUSTING NUT . . . permits exterior adjustment of V-Belt. An inspection plate (at rear) may be removed for visual adjustment or replacement of belt.

8. CRIB AND MULLER SCRAPERS . . . assures ease of cleaning, no "build up" of material, and are vital to many specialized mixing jobs. Integral design of crib, turret and bedplates also provides quicker, easier cleaning.

THE laboratory mortar and pestle has long been the world's "number one" method for establishing mixing standards and checking quality and efficiency. Your *modern* "mortar and pestle" is the new Simpson LF MIX-MULLER . . . with a special pair of revolving mullers and plows to provide the rubbing and smearing action that so thoroughly blends components into a uniform, inseparable mass.

Manufactured to the same exacting standards as the full line of larger Simpson MIX-MULLERS, the 24" pan diameter LF has all components—mullers, turret, crib, etc. . . . including batch capacity—scaled down proportionately. It provides a simple, extremely accurate working duplication of production mixing, for both laboratory and pilot plant service.

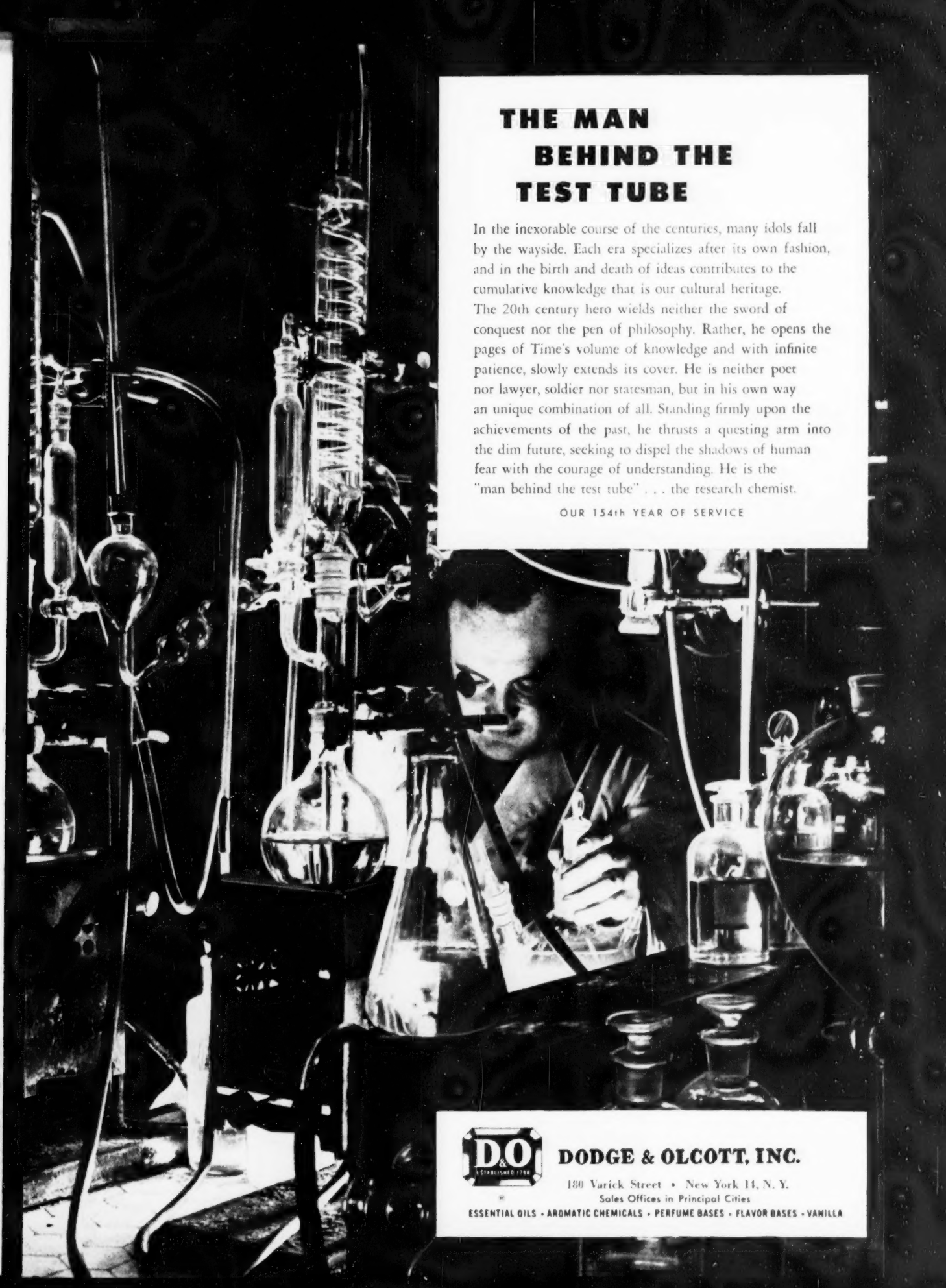
Bring modern "mortar and pestle" accuracy to your laboratory mixing. Consult a National engineer today.

Write for Bulletin 515.

SIMPSON *MIX-MULLER*® DIVISION

NATIONAL ENGINEERING CO., 622 Machinery Hall Bldg., Chicago 6, Ill.

(Not Inc.)



THE MAN BEHIND THE TEST TUBE

In the inexorable course of the centuries, many idols fall by the wayside. Each era specializes after its own fashion, and in the birth and death of ideas contributes to the cumulative knowledge that is our cultural heritage. The 20th century hero wields neither the sword of conquest nor the pen of philosophy. Rather, he opens the pages of Time's volume of knowledge and with infinite patience, slowly extends its cover. He is neither poet nor lawyer, soldier nor statesman, but in his own way an unique combination of all. Standing firmly upon the achievements of the past, he thrusts a questing arm into the dim future, seeking to dispel the shadows of human fear with the courage of understanding. He is the "man behind the test tube" . . . the research chemist.

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Nine to four—that's the ratio of the monoglyceride content in Myverol® Distilled Monoglycerides to that of ordinary commercial monoglycerides for food use.

That means it takes less to create sales-stimulating texture in baked goods, margarine, dessert topping, peanut butter, and other food products.

Myverol Distilled Monoglycerides, prepared from natural fats and oils, get their high efficiency from DPi's molecular distillation method, which concentrates them to a 90% monoester content, practically free of diglycerides and constituents that inhibit emulsifying or degrade taste.

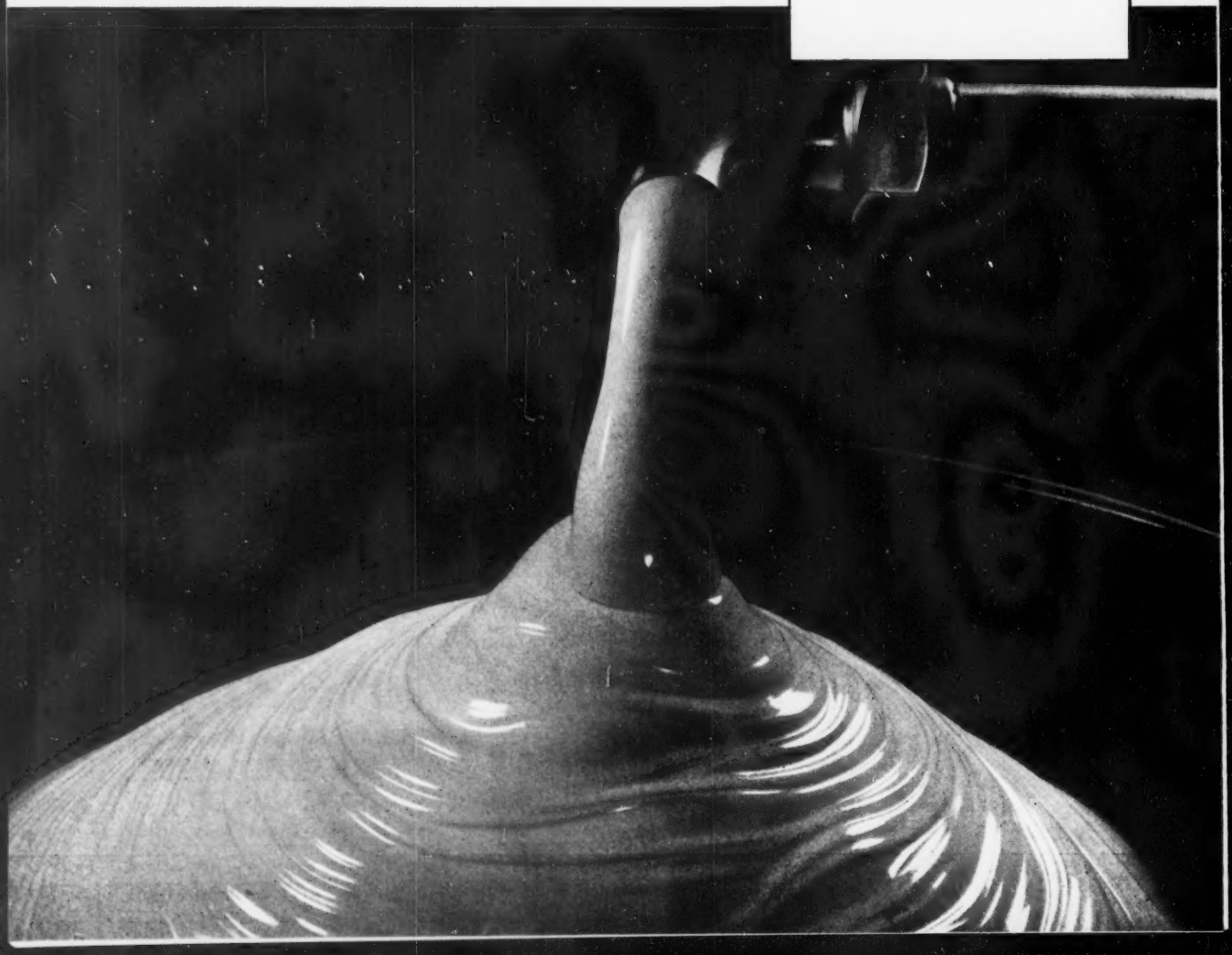
These wholesome products are homogenized with nitrogen to produce a smooth, white cream that blends easily in your mixes. Let us send you a sample for test. Just write, wire, or phone ***Distillation Products Industries,*** Rochester 3, N. Y. Sales offices: New York and Chicago • W. M. Gillies and Company, Los Angeles and San Francisco • Charles Albert Smith Limited, Montreal and Toronto.

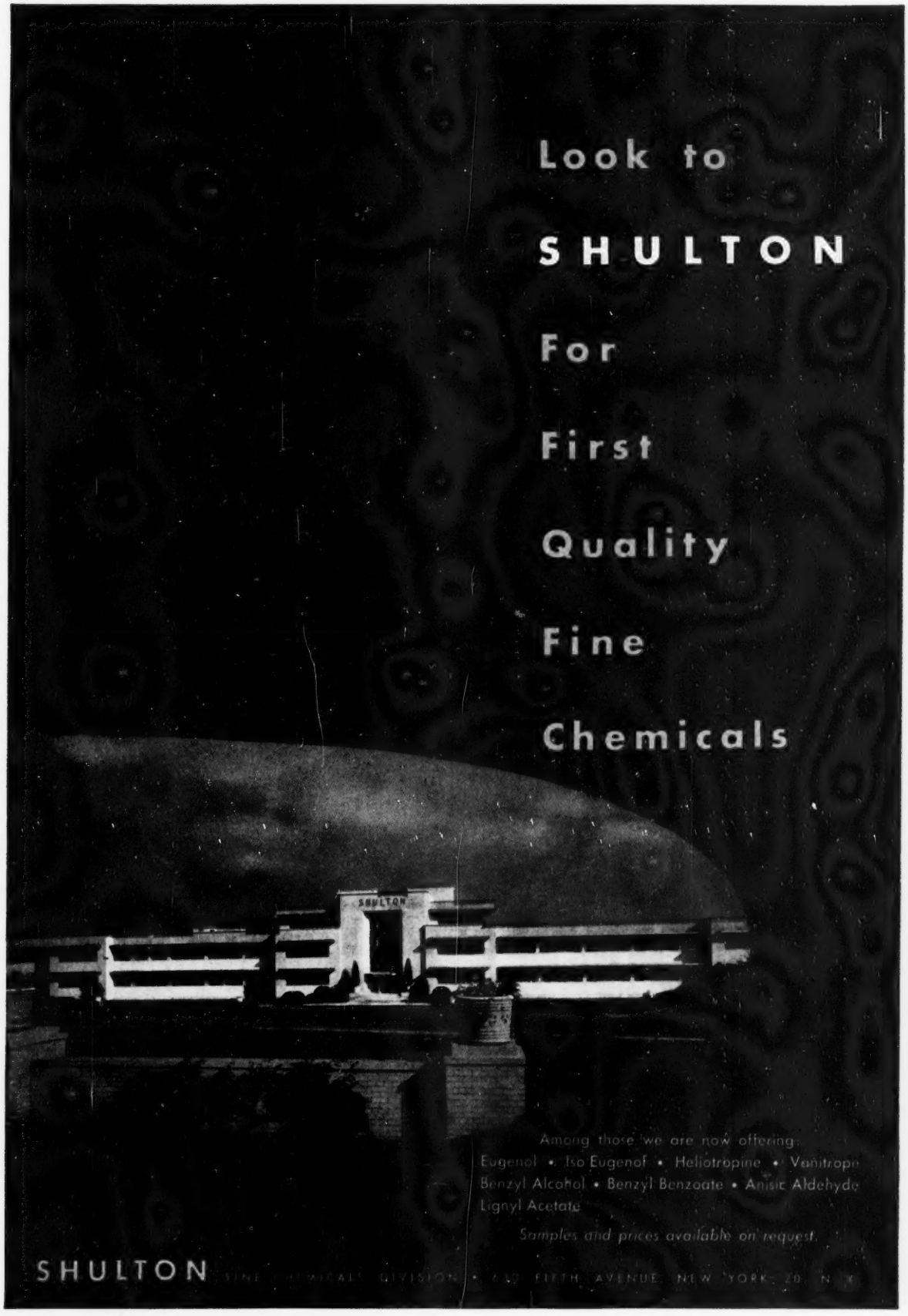
Distillation Products Industries *is a division of* **Eastman Kodak Company**

distillers of monoglycerides from natural fats and oils

Also . . . vitamins A and E

DPi





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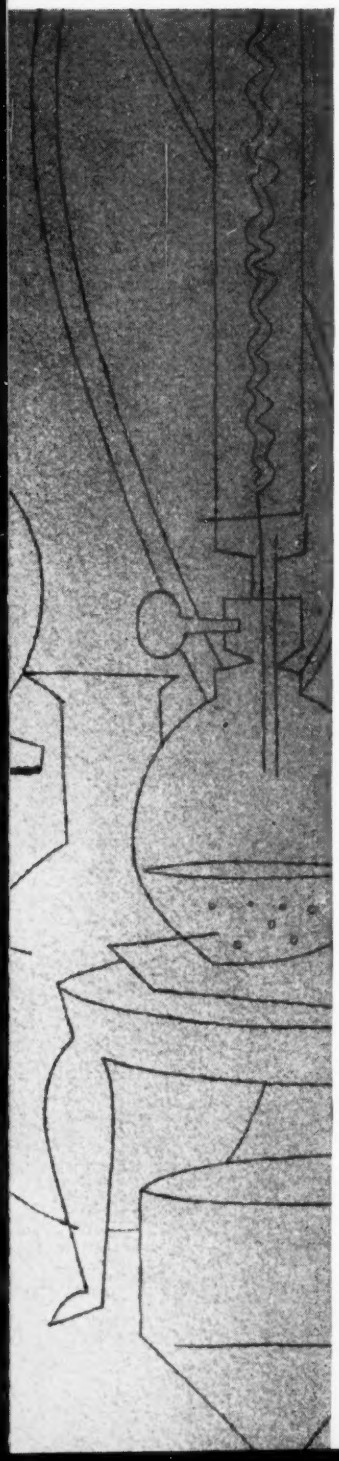
OF CHEMISTRY

AND CASH REGISTERS...



In Pfizer research laboratories, the language of the cash register . . . in terms of profits for food processors . . . is spoken as fluently as the language of chemistry. That's because Pfizer chemists are constantly searching for better ways to

1. CUT PROCESSING COSTS IN FOOD PLANTS
2. GIVE ESTABLISHED FOOD PRODUCTS GREATER SALES APPEAL
3. HELP CREATE NEW AND BETTER FOOD PRODUCTS
4. SIMPLIFY HANDLING

All four have a single aim: greater profits for food processors.

Take Pfizer **CITRIC ACID ANHYDROUS** for example. As an acidulant for carbonated beverages, sherbets, gelatin desserts, jams and jellies, this Pfizer development enhances natural fruit flavor, giving these foods greater sales appeal. Having no water of crystallization, it has important advantages over hydrous citric acid. It cannot dry out, even after months of storage . . . it does not cake under proper storage conditions nor absorb water from the atmosphere. The absence of water of crystallization makes it possible to prepare stable dry food mixes which otherwise would cake badly in storage. Greater uniformity of acidulation is possible because the composition remains constant. And Pfizer Citric Acid Anhydrous can cut freight costs because there's no water to ship.

ASCORBIC ACID . . . Vitamin C . . . is widely used as an antioxidant to retard the development of off-color, off-flavor and rancidity. Packers of frozen fruits and fish have for many years recognized the added sales appeal gained by adding Pfizer Ascorbic to their packs. As an antioxidant, Ascorbic is also favored in preparing beverages and processed foods where oxidative spoilage is a problem. Processors of juices, concentrates and fruit ades, too, will find Pfizer Ascorbic a sales builder when used to standardize the Vitamin C content of their brands.

VITAMIN B_{12} . . . this newest member of the Vitamin B Complex offers great promise in the field of nutrition. Recent clinical research has indicated that Vitamin B_{12} exerts a growth-promoting effect when given as a dietary supplement to children with growth failure. Both Vitamin B_{12} Oral Grade Solids and B_{12} Crystalline have been found to be equally effective. Since Pfizer Oral Grade Solids is the less expensive form, it will be of especial interest in fortifying foods.

Pfizer maintains a skilled staff of technicians ready to assist you in food processing problems. For technical assistance or additional information on these products write:

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630 Flushing Ave., Brooklyn 6, N. Y.
Branch Offices:
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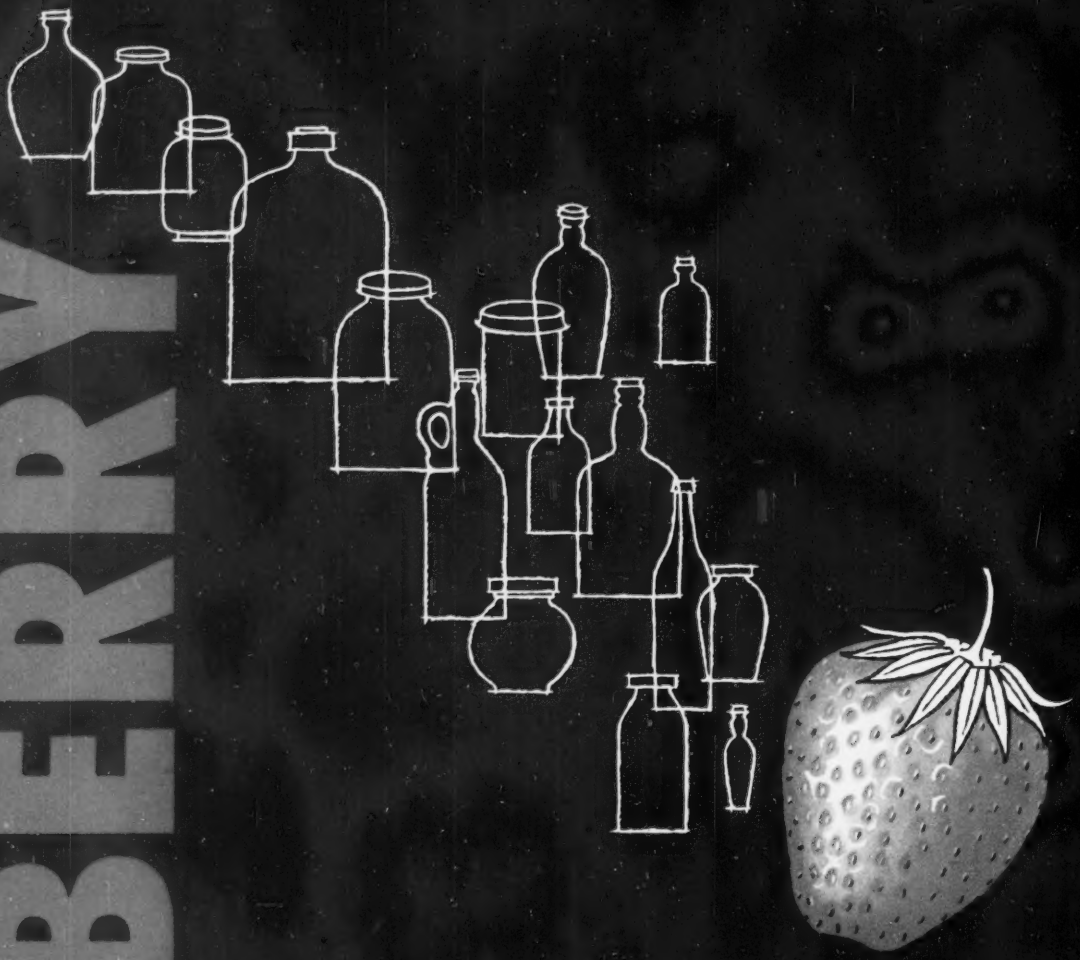
Manufacturing Chemists for Over 100 Years

Pfizer

STRAWBERRY



An imitation only in that it is man-made. SYNFLEUR IMITATION STRAWBERRY 1950 is an exact reproduction of Nature's finest, challenging even the expert to distinguish the one from the other.

This true-to-nature flavor, produced by the finest chemists against the SYNFLEUR background of more than 60 years of successful flavor creation, is applicable and especially valuable wherever full, honest strawberry taste and odor is required.

If your product requires strawberry, you can supply it in full measure, economically, with superior quality SYNFLEUR IMITATION STRAWBERRY 1950. Order a trial pint today at $3.25 postpaid.

SYNFLEUR IMITATION STRAWBERRY 1950 *is part of a complete line of superb flavorings. Write for full information about flavors you are interested in, advising the products to be flavored.*

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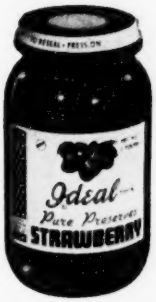
How AMERICAN STORES CO. makes a fast-selling preserve

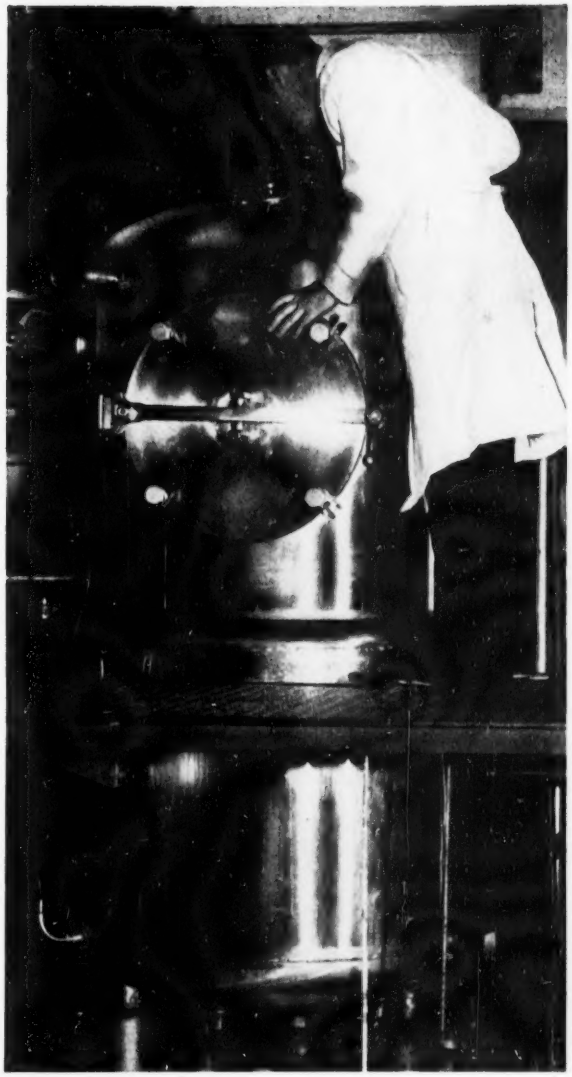


Repeat sales of Ideal Brand preserves don't just happen.

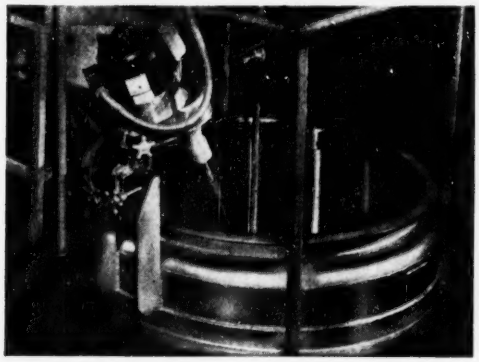
Ideal Brand has "rung the bell" of customer acceptance with a preserve that is easy to spread, full-flavored and consistently high in quality. Yet it is economical to produce.

American Stores Co. does it with a Pfaudler Stainless Steel Vacuum System. Sanitary and easy to operate, this system provides accurate control over the dispersal of fruit in the juice and traps the flavor into the preserve by evaporating water at lower than the normal boiling temperature. This prevents change in the natural qualities of the product caused by high temperature processing . . . assures a *true* fruit flavor.

If you want a product that will *easily* win customer acceptance, offer the easy-spreading firmness, fresh flavor and appetizing color of a preserve processed by a Pfaudler Vacuum System. Learn more about what this system can do for you now. Call your nearest Pfaudler office today.



PFAUDLER VACUUM PAN removes water without interference with natural flavor and other qualities of ingredients. Built to withstand the pressure of 100% vacuum, it is also equipped with a sampler to permit easy withdraw of samples.



PFAUDLER MIXING TANK thoroughly blends all ingredients before they go into the vacuum pan for final processing.

Pfaudler

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Send me details on Pfaudler ☐ Vacuum Pan ☐ Mixing Tank

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Company _____

Address _____

City _____ Zone _____ State _____

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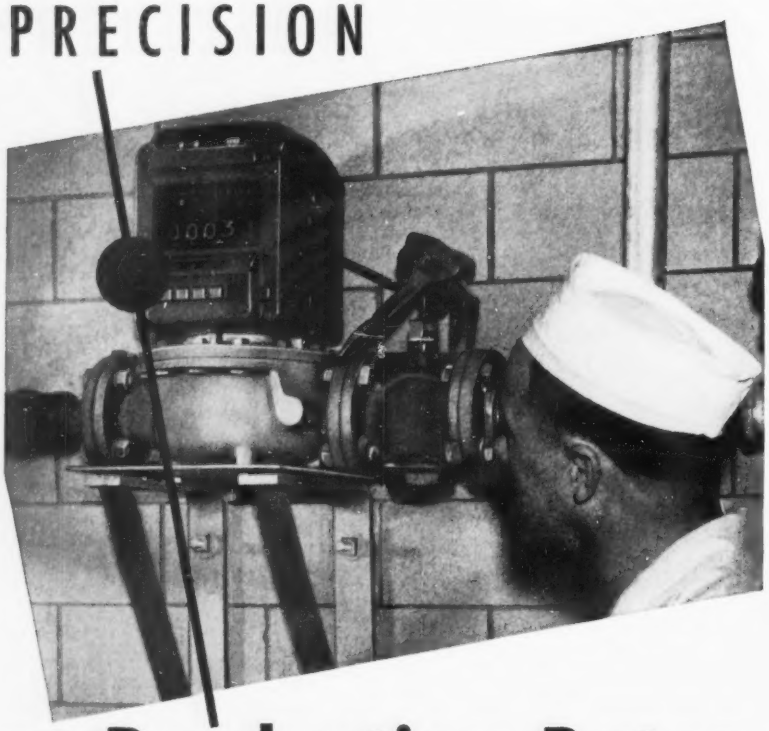
LABORATORY PRECISION



at Production Rates

WITH

NEPTUNE *liquid* METERS

Batch mixing with laboratory precision is automatic with these Neptune Auto-Stop liquid meters. You simply push buttons to set the quantity of ingredients required by formula, open the valve, and the meters do the rest. They pay for themselves by eliminating spoilage, spillage, over-filling and the fuss and muss of gauge sticks, pails or batch tanks.

The easy to read registers give you accurate, quick cost accounting figures too. The Auto-Stop is only one of many Neptune meters available for handling over a hundred industrial liquids—including water, syrups, brines, oils and many chemicals. Famous for simplicity, sustained accuracy, and low maintenance. Telephone or write our nearest branch for quick information.

SEND FOR NEW BULLETIN 566-HF . .

. . . a gold mine of information that helps select the right meter for your process.

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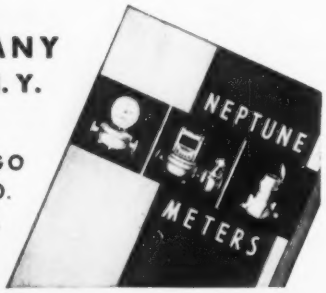
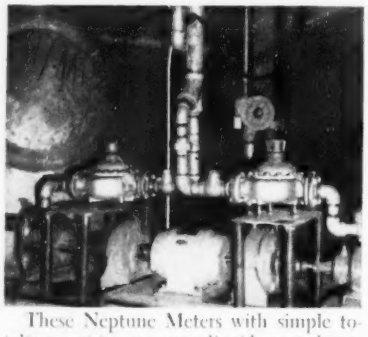


(ADVERTISEMENT)

36 Different Ingredients Handled by Liquid Meters, 174 Food Plants Report

Accurate control of batch mixing, general process control, and inventory control are the three biggest advantages offered by positive displacement meters now in use in their plants, according to executives and technologists in 174 food companies in a recent survey. Discussing applications for meters of the type manufactured by Neptune Meter Company, more than 36 liquids were reported, including water (hot and cold), corn syrups, liquid sugars, and other sweeteners; cocoa butter, cocoanut oil, and other fats and oils, chocolate, flavors, coffee, wine, alcohol and many others. Most desirable feature for accurate batching was said to be the automatic quantity cut-off (Neptune Auto-Stop). Other types in use includes round-dial registers for manual batching or periodic readings, and simple totalizing registers used where infrequent readings for inventory control were required.

You simply push the buttons on this Model 432 Auto-Stop meter to set the pounds or gallons required by the formula, open the valve, and the meter shuts the valve automatically at the required amount.



These Neptune Meters with simple totalizer registers measure liquid sugar drawn from storage tanks, keeping tabs on inventory. Neptune **batching** meters also have totalizer counters, so accurate records can be kept.

Helpful Information Offered

Information helpful in selecting the right liquid meter for any specific application is offered free. Ask for Bulletin 566 HF. Neptune Meter Company, 50 W. 50 St., New York 20, N. Y.

Griffith does it Again!

First to Develop OIL-SOLUBLE Antioxidants

Now Introducing Monoglyceride* Stabilizers— Both Oil-Soluble and Water-Dispersable!

No Propylene Glycol in these formulas—all are non-reactive with iron. Packed safely in ordinary steel drums. No deposit.

Check these 4 Antioxidants For Choice of Proper Stabilizer For Your Particular Needs

G-4

TYPE C... The original, economical, all-purpose *oil-soluble* antioxidant—for lard and other edible fats and oils sold at retail. Contains Propyl Gallate and Lecithin-Citrate, patented by Griffith. Dissolves by easy stirring.

***New TYPE M...** In this formula Monoglycerides replace Lecithin as the solublizer of Citric Acid. It also contains Propyl Gallate for long stability. *New TYPE M* "G-4" dissolves by easy stirring because, like all Griffith antioxidants, it is fat-soluble and naturally becomes part of the lard. It is water-dispersable, too. (*Patent applied for.*)

G-5... The fat-soluble antioxidant that contains Lecithin-Citrate, and BHA for *high "carry through"* stability in cracker baking. (*Patent applied for.*)

***New G-8...** A variation of the "G-5" formula —with a Monoglyceride-Citrate combination instead of Lecithin-Citrate. Except for its BHA content, "G-8" is the same as *New TYPE M* "G-4" antioxidant, described above. (*Patent applied for.*)

We'll be glad to consult with you and assist in selecting the proper antioxidant for the most practical and profitable stabilization of your products. Tell us your problem.

THE Griffith LABORATORIES, INC.

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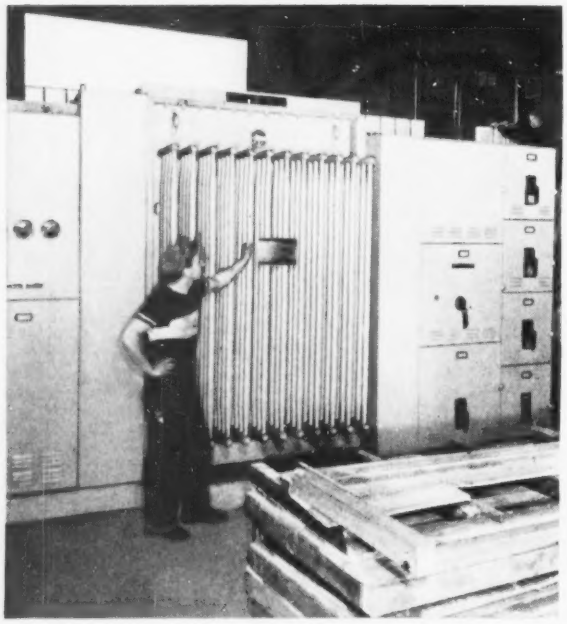
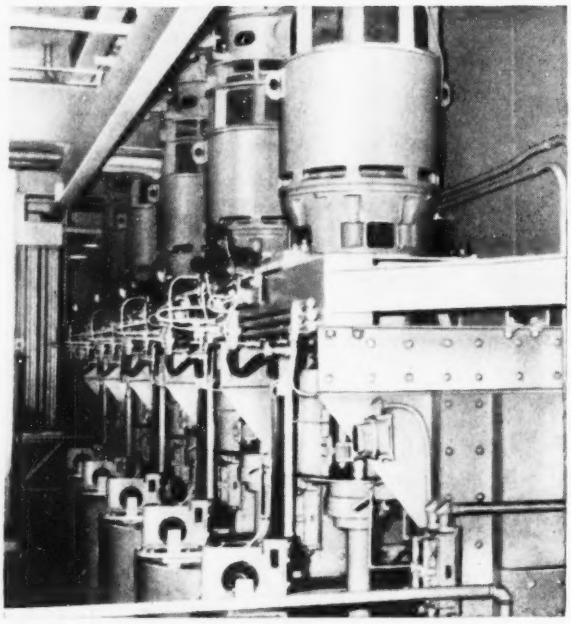
For more information, use coupon on page 201.

MASTER PLAN for National Sugar's new a-c power distribution system at Philadelphia was developed by this engineering team. Left to right: Frank LeCompte, Construction Engineer; Joseph Harrison, Electrical Engineer; Newton Smith, Plant Engineer; Lloyd Johnson, G-E Sales Engineer. Plan served as guide to flexible system that will simplify plant expansion.

Planned step-by-step modernization

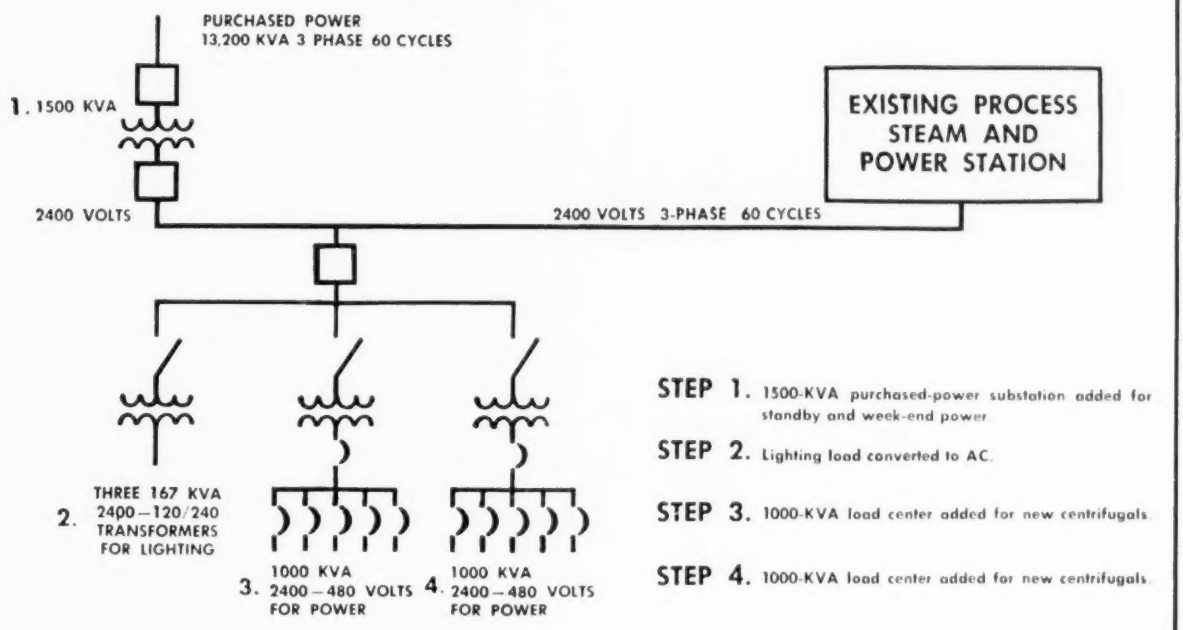


VOLTAGE IS STEPPED DOWN FOR CENTRIFUGALS by this G-E load-center substation. As future expansion takes place, others will be located in load areas throughout the plant.



MOTORS, CONTROL COST LESS—National Sugar's Pennsylvania Division modernized with automatic a-c driven centrifugals like these—cut installation costs, simplified controls.

For more information, use coupon on page 201.


PURCHASED POWER
13,200 KVA 3 PHASE 60 CYCLES
1. 1500 KVA
2400 VOLTS
EXISTING PROCESS STEAM AND POWER STATION
2400 VOLTS 3-PHASE 60 CYCLES
2. THREE 167 KVA 2400—120/240 TRANSFORMERS FOR LIGHTING
3. 1000 KVA 2400—480 VOLTS FOR POWER
4. 1000 KVA 2400—480 VOLTS FOR POWER
STEP 1. 1500-KVA purchased-power substation added for standby and week-end power.
STEP 2. Lighting load converted to AC.
STEP 3. 1000-KVA load center added for new centrifugals.
STEP 4. 1000-KVA load center added for new centrifugals.

SUGAR PRODUCTION WAS UNINTERRUPTED while the National Sugar Refining Company—producers of Jack Frost, Quaker, and Arbuckle's Sugar—carried out step-by-step power system expansion. Load-center substations, heart of new plan, make expansion easy—keep cost at minimum. Savings in cable, and a-c drives, have more than paid for system.

pays off at National Sugar Refining

Long-range system planning results in area-by-area modernization of both process and electrical systems at minimum investment

If your electrical distribution system can't take care of expanding production—and if complete modernization at one time would interfere with production and be uneconomical—then you'll be interested in the way the Pennsylvania Sugar Division of the National Sugar Refining Company solved this problem.

System *planning* was their key. G-E application engineers worked with Mr. Frank LeCompte, Construction & Development Engineer at National Sugar's Pennsylvania Division. Together, they designed a master a-c distribution system that was geared to the present system—and would accommodate future plant growth at minimum cost.

Then National Sugar put this master plan into action. The new a-c distribution system was purchased and installed section by section as processing facilities were modernized and expanded. This new system paid its way in savings in equipment, materials, and installation costs.

Reductions in original costs and capitalized operating expenses of ten new centrifugals, effected by using a-c instead of d-c drives, equalled the price of two new G-E load-center unit substations and several units of 2300-V switchgear. A 1500-KVA substation, operating from purchased power, quickly justified itself in meeting emergency standby requirements and in furnishing power on weekends.

General Electric application engineers can help you save the same way with a new power distribution system. Contact your nearby Apparatus Sales Office early in your planning. General Electric Co., Schenectady 5, N. Y. 652-13

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Engineered Electrical Systems for Food Processing Plants

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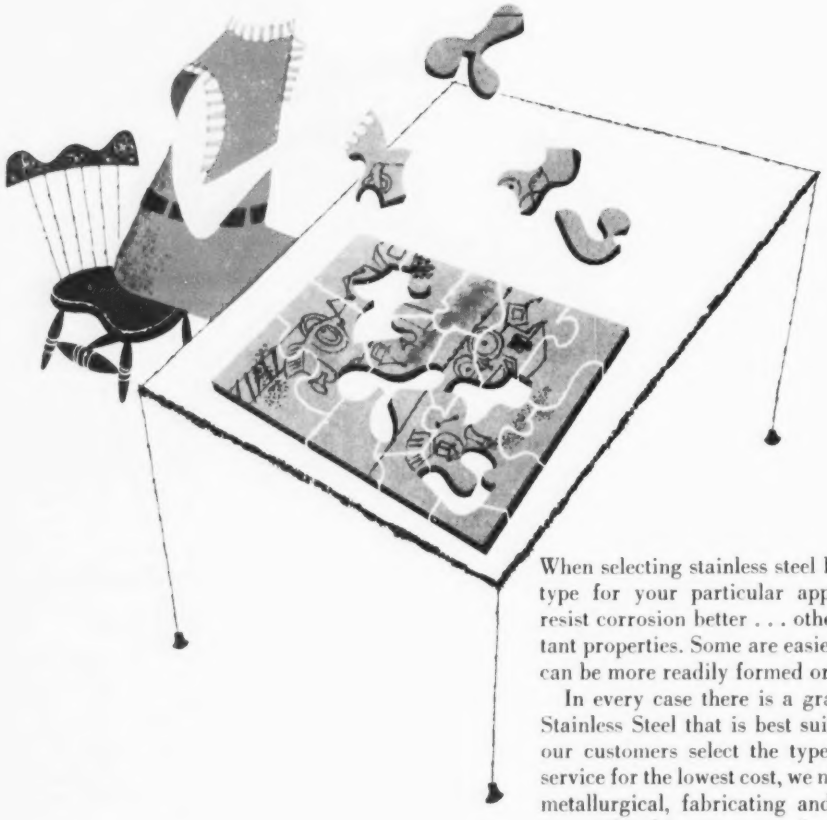
pick the stainless that fits best



When selecting stainless steel be sure you pick the correct type for your particular application. For some grades resist corrosion better . . . others have superior heat resistant properties. Some are easier to machine . . . still others can be more readily formed or welded.

In every case there is a grade of Crucible REZISTAL Stainless Steel that is best suited to the job. And to help our customers select the type that will provide the best service for the lowest cost, we make available all the design, metallurgical, fabricating and application data we have accumulated in our years of stainless steel experience with many different industries.

Our staff of field representatives brings you the benefit of our vast technical resources. And the quality of REZISTAL Stainless Steel sheets, strip, plates, bars, wire, forgings, castings and tubing produced in our modern integrated mills is unsurpassed in the industry. When you have an application for stainless, call Crucible.

CRUCIBLE first name in special purpose steels

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STAINLESS • REX HIGH SPEED • TOOL • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS

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FLAVOR is in the bag with NATURAL SPICES

True flavor that stays true and lasts "from making to eating" is assured only when you use natural spices.

For natural spices are the only flavorings that retain their full strength until eaten through nature's own unique protection. An intricate fibrous cell structure protects that flavor in natural spices against excessive evaporation, loss or change by volatilization, oxidation or chemical change.

If you want the full flavor to remain with your product, to bring the customers back for more, natural spices are a natural choice.

KNICKERBOCKER offers the finest in natural spices with a knowledge and skill gained in over 110 years of experience. KNICKERBOCKER natural spices are selected, laboratory tested and graded with maximum care and accuracy to give you the best at the best possible price. Don't look for spice bargains – there are none. The finest spices will bring the greatest returns in repeat business.

Naturally Better Spices = Better Baked and Canned Goods = Better Sales

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Glycerophosphates • Guaiacols • Hexamethylenetetramine • Medicinal Colloids • Methylene Disalicylic Acid • Neomycin • Paraformaldehyde
Parahydroxybenzoates • Penicillin • Pentaerythritols • Propyl Gallate • Resorcinol • Salicylates • Salicylic Acid • Streptomycin

Vitamin A-Roche'
in batch size cans
or in bulk for
food mfrs.—

You can have the acetate in potencies up to 300,000 units per gram in edible oil, in sanitary tin cans of various sizes for batch mixing -- or in large, specially-developed bulk packings up to 50 kilos. The palmitate is similarly available, and in potencies of 500,000 to 1 million units per gram.

Vitamin A-Roche
is quickly available
to your specs, at
low, stable cost—

Look at these advantages of Roche vitamin A: steady supply, quick delivery -- by the tons, highest quality, unvarying standard, no "fishy" odors or taste, and top-flight technical assistance. Just phone the Vitamin Division now, at Nutley 2-5000 or write to Hoffmann-La Roche Inc., Nutley 10, N.J.

Nature makes sorbitol HERE

ATLAS
makes sorbitol from *farm-produced sugars*

Sorbitol is found in nature as a sweet, nutrient ingredient of many edible fruits and berries. Sorbitol is now available from Atlas in mass production quantities for food use, derived from abundant farm produced sugars.

For many years, sorbitol has been known and used by dietary specialists and for the synthesis of Vitamin C (ascorbic acid). It is a member of the higher alcohol family of substances which includes other well-known edible compounds. The metabolism of sorbitol has been thoroughly studied. When used in appropriate quantities, sorbitol is wholesome and has a nutritive value equivalent to sugar.

Food technologists, encouraged by its current availability at low cost and its interesting qualities, have been studying the application of sorbitol to various types of foodstuffs. They have found advantages for sorbitol for a variety of applications on account of its ability to stabilize moistness, extend shelf life and create distinctive new effects.

Two forms of Atlas sorbitol are available: (1) SORBO® (70% sorbitol solution) and (2) Crystalline (either pellets or powdered). Why not check the possibilities for sorbitol in *your* product?

Food to which sorbitol has contributed outstanding new qualities include: shredded coconut, beverages, glace fruits, marshmallows, caramels, nougats, fudges, chewing gum and flavor preparations.

INDUSTRIAL CHEMICALS DEPARTMENT
ATLAS POWDER COMPANY
WILMINGTON 99, DELAWARE
offices in principal cities
ATLAS POWDER COMPANY
CANADA, LTD.
BRANTFORD, CANADA

For more information, use coupon on page 201.

News in 1940—production necessity today

ONLY a few years ago, the science of sensitive, accurate measurement was limited to laboratories. But today, this science is practiced every day in thousands of industrial plants by factory men . . . who don't have to be instrument experts.

Production men wanted to put this science to work, for they had long known that many processes would function at greater efficiency if temperature, pressure and other variables could be more accurately maintained. Although these potential benefits could be proved in the laboratory or in pilot plants, they could seldom be exploited fully in actual production.

Milestone in measurement

One of the main reasons was that existing industrial methods of measurement were not sufficiently accurate, sensitive or fast. Instruments with delicate mechanical balancing systems suffer inherent limitations . . . always require a compromise between sensitivity and ruggedness . . . and can provide only periodic measurements.

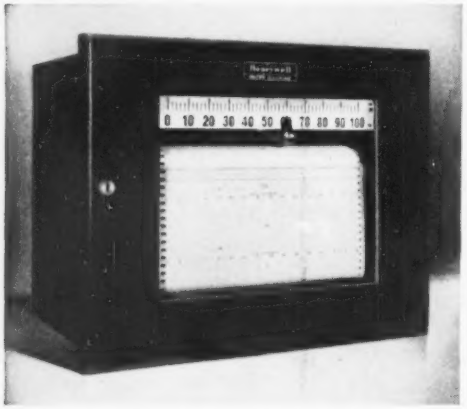
Then, in 1940, the advent of *ElectroniK* instruments swept away these limitations. By adopting an entirely new approach—electronic continuous balancing—these instruments revolutionized the concepts of industrial measurement. They placed laboratory accuracy and sensitivity at the disposal of the production man . . . with all the simplicity and ruggedness demanded by industrial service . . . *plus* speed of response never before economically practical.

Proved by years of performance

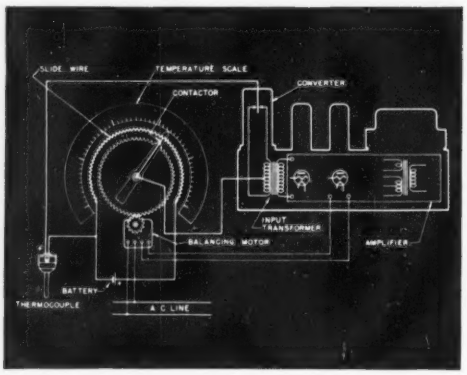
In the past thirteen years, thousands of plants have discovered almost endless applications where the superior performance of these instruments helps to improve operations. The more they learn about *ElectroniK* instruments, the more they call on them for increasingly complex tasks of measurement and automatic control.

Since 1940, the *ElectroniK* family has grown to encompass a host of new indicating, recording and controlling models . . . capable of measuring scores of different process variables . . . equipped with the most advanced types of automatic control. In anticipation of the needs of the future, Honeywell's intensive development program is bringing to readiness even more advanced equipment for tomorrow's process control problems.

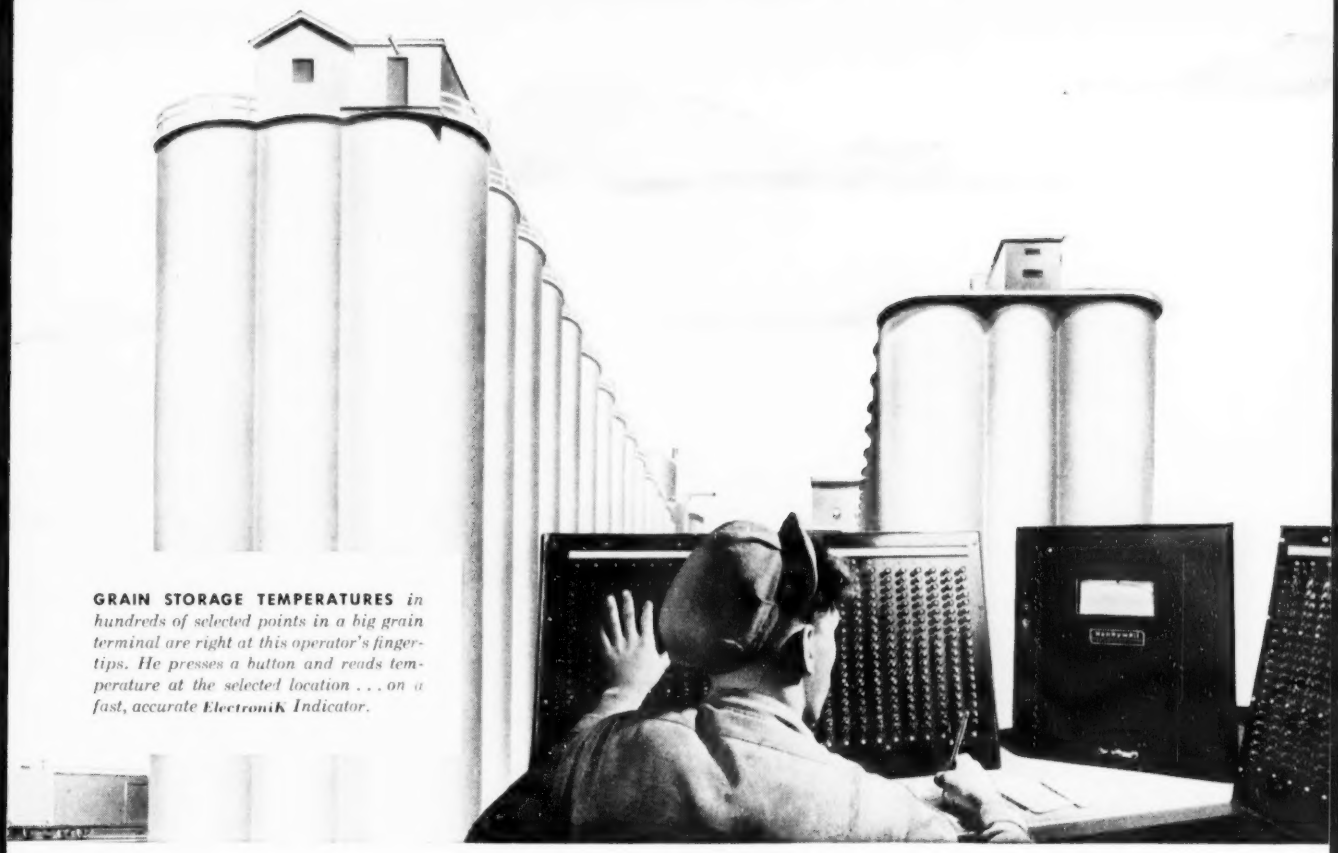
ElectroniK speed progress



A FAMILIAR SIGHT *to thousands of production men, scientists and engineers is this strip-chart* ***ElectroniK*** *Recorder, one of a complete family of indicating, recording and controlling instruments.*



POWER PLANT *of* ***ElectroniK*** *instruments amplifies a millionfold the minute electrical signals from thermocouples and other sensing elements.*



GRAIN STORAGE TEMPERATURES *in hundreds of selected points in a big grain terminal are right at this operator's fingertips. He presses a button and reads temperature at the selected location . . . on a fast, accurate ElectroniK Indicator.*

instruments continue to *throughout the food industry*

THE TREMENDOUS advancements made in the food industry have been due in no small part to the availability of modern methods of measurement and control—with *ElectroniK* instruments. On the new, revolutionary processes . . . and on older processes where measurement was previously considered impractical or inaccurate . . . these instruments have made outstanding contributions:

Temperature measurement: multipoint indicators and recorders centralize supervision of grain storage (illustrated above), juice concentration and many other processes.

Temperature control: *ElectroniK* resistance thermometers permit split-degree precision of temperatures in milk pasteurization, evaporation, candy cooking, aseptic canning.

Conductivity control: boosts efficiency of caustic peelers.

pH control: neutralizes cream continuously . . . automatically.

Speed control: improves quality of baked goods through automatic regulation of oven feed.

Density control: aids processing of sugar liquor to specified Brix value.

The versatile family of *ElectroniK* instruments is ready to serve you, whether you're expanding or modernizing your production. You'll benefit, too by the application know-how that Honeywell has gained in years of food industry experience. Your local Honeywell engineering representative will be glad to discuss your control problems . . . and he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4502 Wayne Ave., Philadelphia 44, Pa.

● **REFERENCE DATA:** Write for Catalog 1520, "*ElectroniK* Indicators and Recorders."

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Honeywell
BROWN INSTRUMENTS
First in Controls

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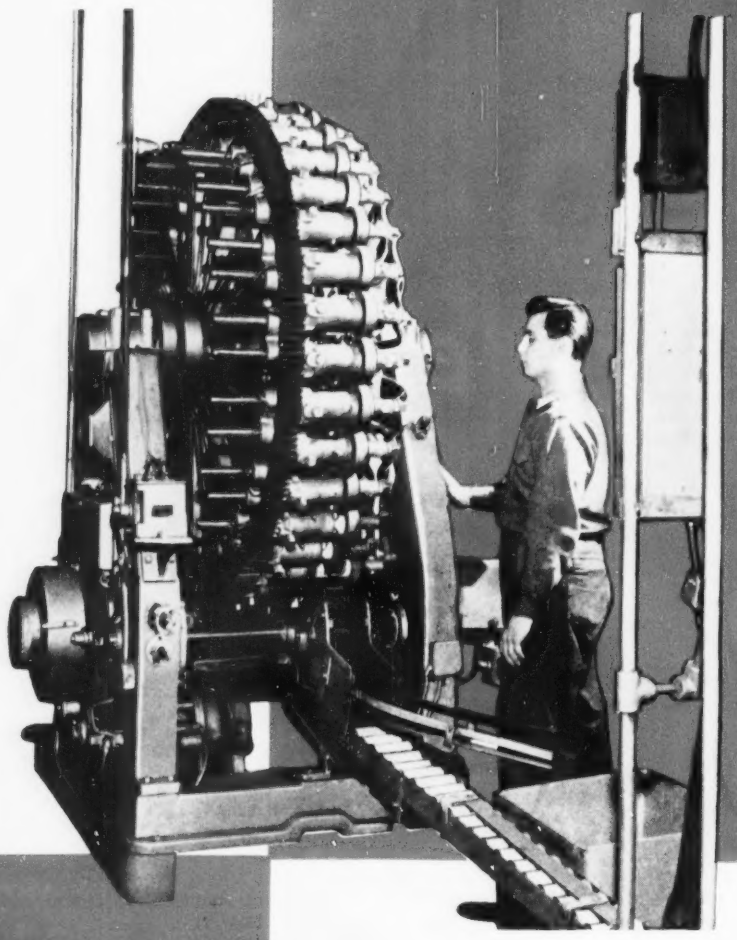

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Executive Offices
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Plants at: CHICAGO, ILL. • MASPETH, N.Y.
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The vacuum tester — under the watchful supervision of John Valente — is an important part of National Can's "Quality Control". This combination of precision machine and competent supervision is typical of National Can service . . . where it counts!

For more information, use coupon on page 201.

If you can make your product better by removing troublesome

GLUCOSE or **OXYGEN**

do it now... with

DeeO® (DeeGee)

another in a long series of firsts by TAKAMINE

DeeO is now being successfully applied in:

Egg Solids processing

Other suggested uses:

Canned or Packaged Foods

Bottled Beverages

DeeGee removes GLUCOSE which, in many products, reacts with proteins present (Maillard-type reaction), causing loss of flavor, browning and short shelf life.

DeeO removes OXYGEN dissolved in liquids or in contact with sealed foods preventing oxidation of flavor and color bodies.

Reactions catalyzed by DeeO (DeeGee):

glucose + oxygen + water $\xrightarrow{\textbf{glucose-oxidase}}$ gluconic acid + hydrogen peroxide

hydrogen peroxide $\xrightarrow{\textbf{catalase}}$ water + oxygen

NET REACTION:

glucose + oxygen $\longrightarrow$ gluconic acid

(The gluconic acid formed is innocuous and actually an effective sequestering agent)

DeeO and DeeGee are glucose oxidase-catalase enzyme systems effectively formulated to remove either glucose or oxygen from food and many industrial products.

OTHER TAKAMINE ENZYMES INCLUDE

Amylases (starch splitting) and Proteinases (protein splitting) for use under varying conditions of pH and temperature

Write our Technical Service Dept. for further details and samples

TAKAMINE

TAKAMINE LABORATORY, INC., CLIFTON, NEW JERSEY

Gentlemen: We are interested in the use of DeeO (DeeGee).

Name_____ Title_____

Firm Name_____

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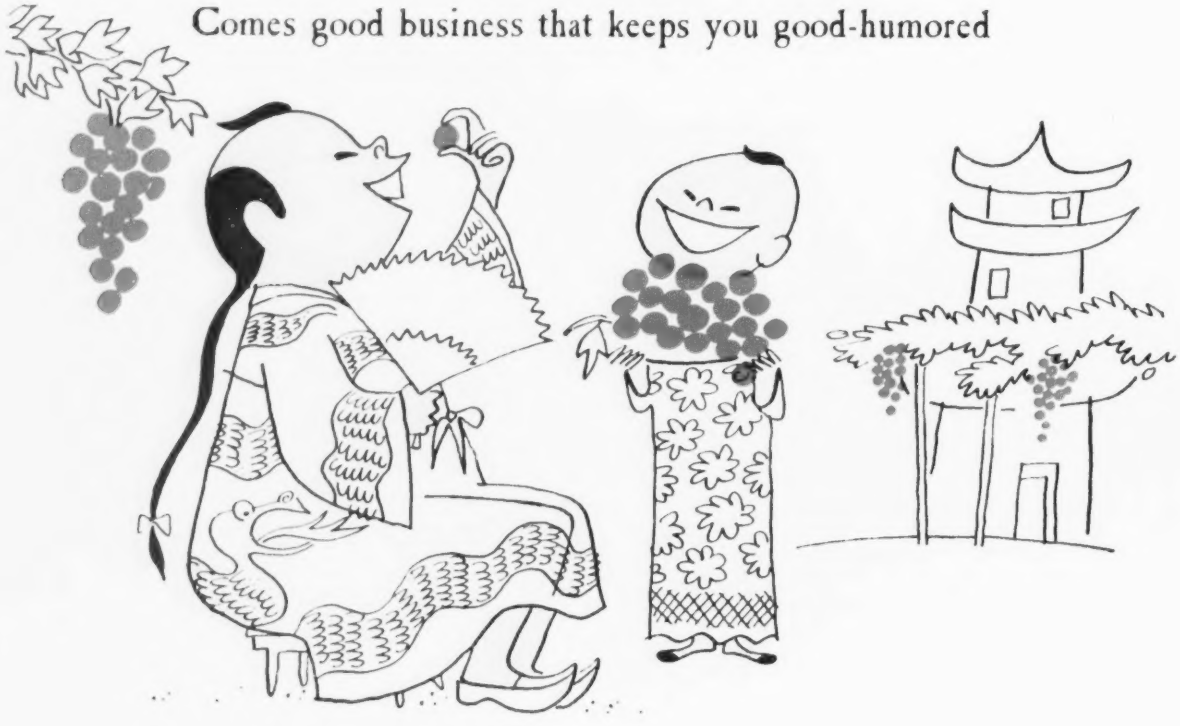
City_____ Zone_____ State_____

For more information, use coupon on page 201.

From the gardens of long-ago China
Came the very first Grape, it's rumored;
From the Norda Grape Flavor you use today
Comes good business that keeps you good-humored



You know how good a fresh grape tastes, from a bunch that has grown ripe and fat in the sun. That's why so many people like Norda Grape Flavor so much. It tastes rich and real.

And it is.

Both Norda Concentrated Genuine and Imitation Grape Flavors re-create the richness of true grape. All the grape goodness is there. The taste is appealing and natural. There's body. There's character.

Test, try, and taste Norda Grape for all your grape-flavored products. It will help you improve them. It will help you make money. Generous samples are free. Send for yours today.

Use "A Favorite to Flavor It" .... A Norda Flavor

Norda

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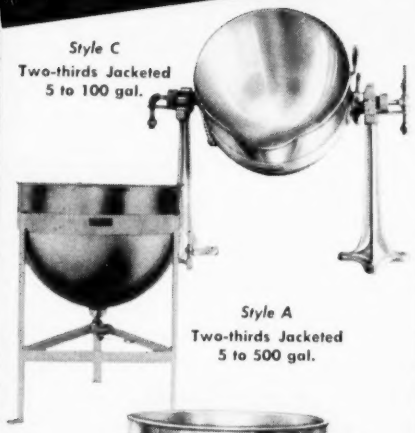
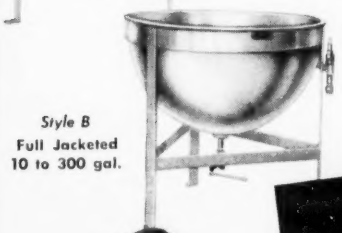
CHICAGO • LOS ANGELES • SAN FRANCISCO • DALLAS • MONTREAL • TORONTO • HAVANA • LONDON • PARIS • GRASSE

COOKING KETTLES

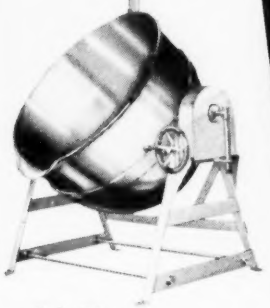


Style C
Two-thirds Jacketed
5 to 100 gal.

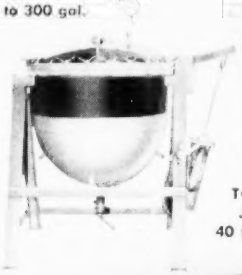
Style A
Two-thirds Jacketed
5 to 500 gal.



Style B
Full Jacketed
10 to 300 gal.

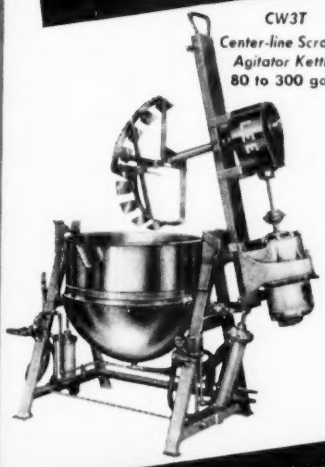


Style CW
Two-thirds Jacketed
80 to 300 gal.

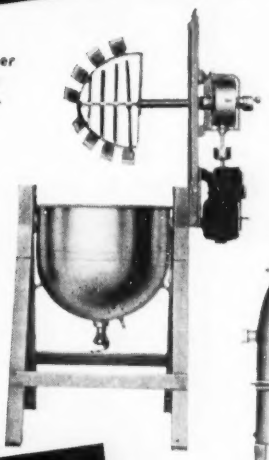


Pressure Kettle
Two-thirds Jacketed
40 to 200 gal.

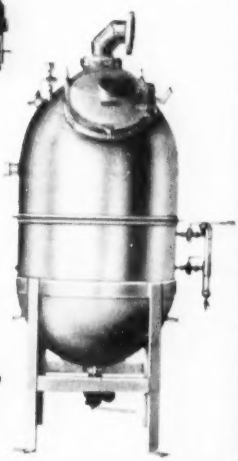
MIXING AND BLENDING UNITS



CW3T
Center-line Scraper Agitator Kettle
80 to 300 gal.



A3T
Center-line Scraper Agitator Kettle
25 to 300 gal.



Vacuum Pan
50 to 500 gal.

Quick Cooling Pan
50 to 200 gal.

these LEE Units

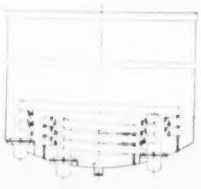
WILL REDUCE YOUR PROCESSING COSTS!

Individually designed for a specific processing operation and available in a wide range of sizes to fit your exacting requirements, Lee corrosion-resistant equipment is built to give you long years of peak performance with minimum maintenance.

Descriptive bulletins are available for any or all of the above units. Write for them today and discover how Lee can help reduce *your* processing costs.

MIXING, COOKING & STORAGE TANKS

Mixing Tank
25 to 500 gal.



Pulp Tank
500 to 2,000 gal.

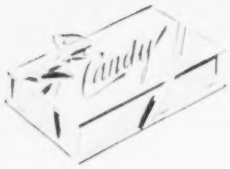
Storage Tank
100 to 5,000 gal.

LEE METAL PRODUCTS CO., INC.

416 PINE STREET,
PHILIPSBURG, PA.

ALL LEE KETTLES ARE MADE TO A.S.M.E. CODE

SEE US AT BOOTH 45—I. F. T.—JUNE 22-24



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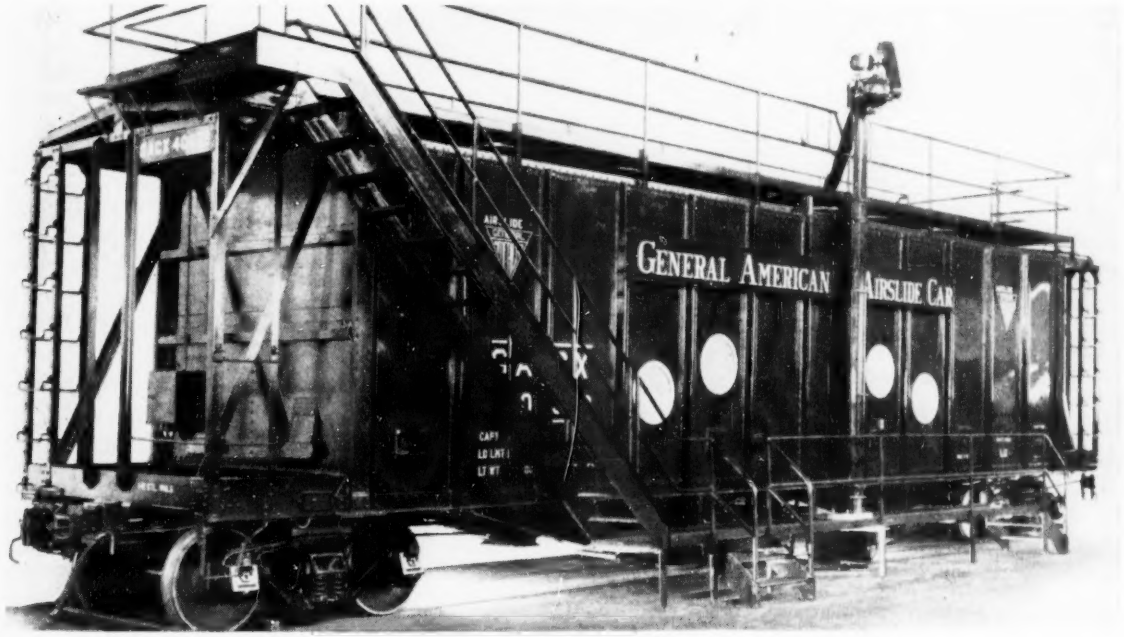
NEW EQUIPMENT & SUPPLIES



New Type Car Broadens Bulk-Shipment Field

Substantial savings in containers, dunnage and labor will now be available to shippers for whom bulk handling has not previously been considered practical. New Airslide freight car does the job.

New carrier is termed a radically new type of covered hopper car. Because of its basically different type of construction, it can be built in sizes of 2,000, 2,600, and 3,600 cu. ft. to cover entire range of powdered commodities of varying densities.

Of the line, the 2,600 car is expected to offer greatest advance in economical transportation of vast variety of commodities having bulk densities in neighborhood of 40 lb. per cu. ft. Car is of particular interest due to AAR limitation of height of center of gravity above rail of 84 in. This is reported to be the first time it has been possible to tailor a covered hopper car to a wide range of lading requirements.

Car was designed in collaboration with Fuller Co., Catasauqua, Pa., utilizing their Airslide. Essential part of this unit is a fabric of special design stretched over a U-shaped shallow steel channel. Channel below fabric forms a plenum chamber into which air is introduced at a pressure of 1 psi. and in varying quantities, depending upon material to be transported.

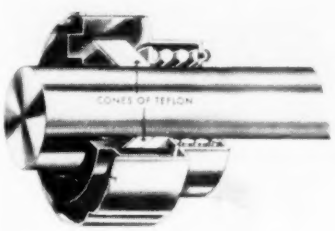
Airslide slopes toward center of car, and as air is forced through fabric, slowly permeating commodity above, lading is aerated and fluidized, causing it to flow like water to unloading point.

As is indicated by car on exhibit, (illustrated above) loading is done very simply by gravity through roof hatches. Lading may be moved from car by either gravity or pneumatics into any conventional conveying system. Only essential piece of equipment which receiver requires, according to car maker, is a small, low pressure blower.

To insure a minimum of product retention in car upon completion of each unloading, design embodies features of all welding construction and 60 deg. slope sheets. Optional nontoxic wax lining, possessing very good corrosion resistant properties, can provide smooth interior surfaces. For several years, this wax coating has been successfully used in maker's Trans-Flo car.—*General American Transportation Corp., Chicago.*

Circle 145A on Reader Service Card

Teflon Cones Employed in Mechanical Seal



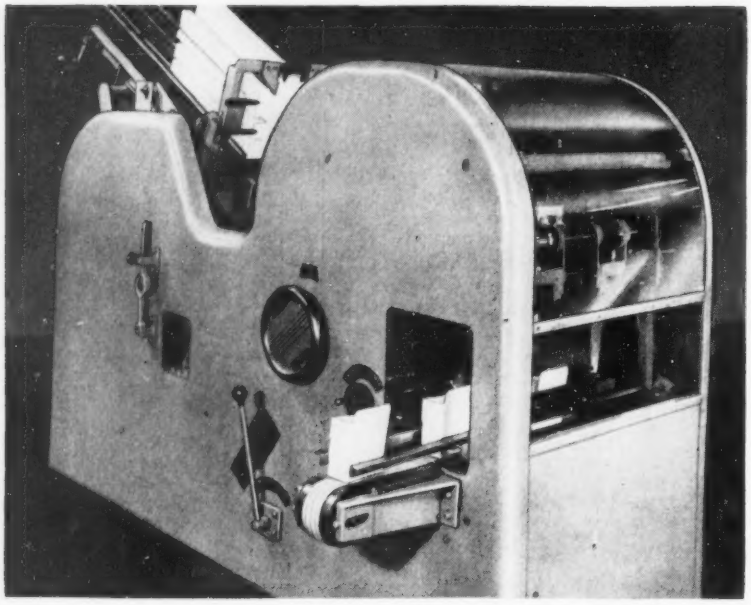
A new all-purpose mechanical seal, known as Type 19, is said to provide life-time performance in small pumps, hot water circulators, and many other rotary shaft applications.

Special beveled cones made of Teflon (tetrafluoroethylene resin) are utilized as the flexible member. This adapts seal for services involving water, oil, corrosives or acids; temperatures from minus 100 to plus 450 deg. F., vacuums and pressures to 200 psi.

A packaged type unit, seal provides quick and easy installation for production assembly and replacement service. It is presently available in sizes to fit shaft diameters of $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$ and $\frac{3}{4}$ in. Metallurgy of seal, bronze, stainless steel, can be specified to meet service requirements or operating conditions.—*Crane Packing Co., 1800 Cuyler Ave., Chicago 13.*

Circle 145B on Reader Service Card

Forms, Lines 150 Cartons Per Min.



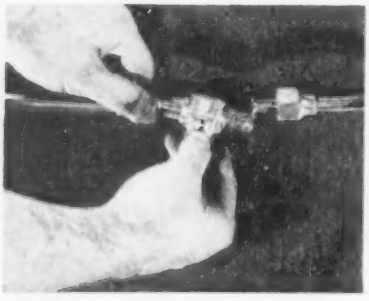
New carton forming and lining machine is claimed to be fastest packaging equipment built for lard and shortening packagers.

Fully automatic unit, the Model SE, is capable of speeds up to 150 or more cartons per minute. Maker states machine is completely new in engineering design, operating principle and appearance. Major feature is its adjustability on location—to handle 1 to 4-lb. cartons. Ease of operation is another improvement—with simplified, easy-to-reach carton and liner paper loading.

Cartons and liners are folded while moving up, rather than down, which also facilitates handling and is stated to produce a better package. Carton lock is termed positive and secure, with rotary tuckers and stationary carton tongue-lifting fingers.—*Peters Machinery Co., 4700 Ravenswood Ave., Chicago 40.*

Circle 146A on Reader Service Card

Moisture Absorbent Unit Is Easy to Install



Efficiency in eliminating moisture from refrigerating systems is claimed with use of a new moisture absorbent desiccant.

An-Drite drying material, and new T-Flo Drier, according to maker, are also seen having applications in industries where excessive moisture affects machine performance.

Drier embodies a new principle of design. Due to interchangeability of all size driers and connectors, it is easy to install and replace. Connectors do not have to be removed from line when changing driers.

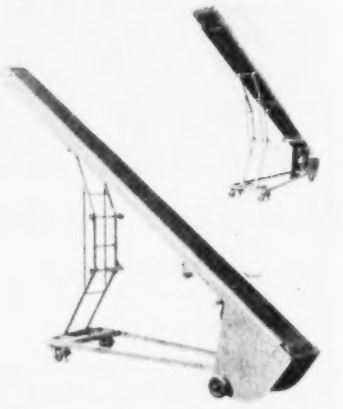
Drier is leak-tested with nitrogen at 300 lb. pressure. It may be hand or wrench-tightened. New gasket principle is stated to provide seal with minimum pressure. Drier can be installed by either standard flare or solder connections.

Desiccant is a chemically treated gelatinous aluminum oxide hydrate in form of $\frac{1}{8}$ in. diameter spheres. Powdering is reported eliminated by a special process. Desiccant will not plug or channel and is termed efficient at temperatures ranging up to 140 deg. F.

Drier is available in 8, 12, 20 and 30 cu. in. sizes. Seven sizes of T-connectors, ranging from $\frac{1}{4}$ to $\frac{5}{8}$ in., are provided. It will be sold exclusively through refrigeration wholesalers.—*Ansul Chemical Co., Marinette, Wis.*

Circle 146B on Reader Service Card

Overhang Feature Marks Portable Conveyor



Undercarriage construction of this new, portable power-belt conveyor makes unit particularly suitable for loading and unloading from balconies, mezzanines and upper floors, since it permits the elevated end of conveyor to overhang.

Known as Model SLJ-40, it is easily maneuverable in either horizontal or inclined position, and cranks up and down to adjust to any angle. Conveyor box rides on trolley wheels during adjustment process.

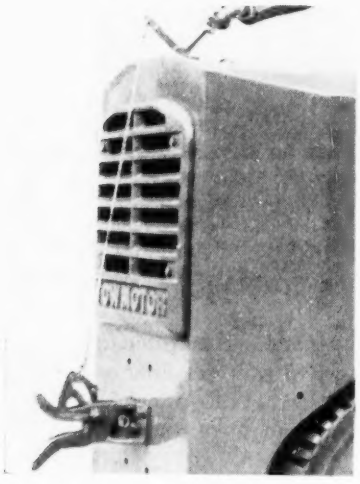
Unit is equipped with a strong winch and cable adjustment rig. It is termed particularly stable, with all weight on lower end to prevent tipping forward when under a full load at top.

Belt movement is reversible and speeds can be supplied at standard 50 fpm. or variable.

Units are available in various lengths and belt widths. Model shown is 16 ft. long, with a 12 in. rubber Ruff-top belt—*Speedways Conveyors, Inc., 1275 Niagara St., Buffalo 13.*

Circle 146C on Reader Service Card

Automatic Couplers Speed Handling of Trailers

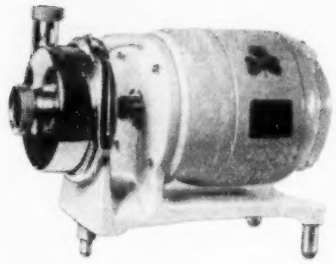


Faster pick-up and release of trailers is reported with use of new automatic couplers on lift trucks and tractors. Installed as replacements for standard towing eyes, they are available in three types.

Each type is built with an open jaw which automatically makes the connection when entered by trailer coupler. One type provides a hand-operated release lever, another a foot lever, third permits operation of release mechanism either manually or by foot pressure. Two of couplers are spring-actuated, other utilizes a ball-type lock. — *Towmotor Corp., Div. 35, 1226 E. 152nd St., Cleveland 10.*

Circle 147A on Service Reader Card

Sanitary Centrifugal Pumps Are Easily Maintained



Efficient transmission and low-cost maintenance are claimed for a line of corrosion-resistant sanitary and industrial centrifugal pumps. Pumps have fast, non-clogging centrifugal action with special seals for practically every requirement, and are available in a complete range of sizes and capacities up to 1,250 gpm.

They feature screw type impellers with sanitary impeller clips, inert carbon seals easily removed for cleaning, lightweight heads with a minimum of parts, and Tri-Clamp casing construction which permits fast, easy pump assembly or disassembly.

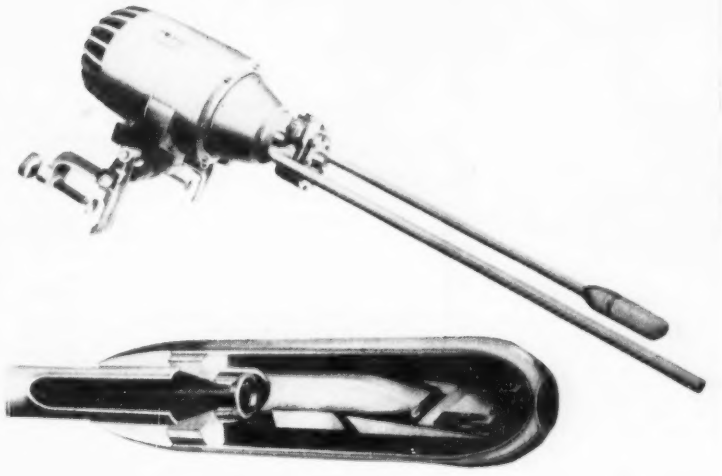
The "Pump King" unimount series illustrated above is designed for efficient operation at 1,800 and 3,600 rpm. where high speeds are required, through heaters, coolers, filters, clarifiers. The 3,600 rpm. model is applicable to dairy industry where high head and low capacity are essential and for handling low and medium viscosity liquids, numerous in food processing industry.

Other sanitary type pumps are available for moving food products such as diced carrots, cream style corn, tomatoes, applesauce, relish.

Industrial corrosion-resistant pumps are designed for handling water, brine, light oils, chemicals, brewery products, and liquids in food processing field where lines are I.P.S. type.—*Tri-Clover Machine Co., Kenosha, Wis.*

Circle 147B on Service Reader Card

Compact Emulsifier Employs Ultrasonics



Fast, efficient emulsification is reported with use of new, compact unit claimed to produce ultrasonic waves by mechanical means. Unit has an output of 5 to 7 gpm.

Machine, known as Rapisonic, is based on principle of Pohlman whistle. Vibrations are brought about by a jet of liquid impingeing on a blade which vibrates at its natural frequency. Both jet form and blade are enclosed by a resonant bell, which concentrates local ultrasonic effect.

Emulsification takes place when cavities are swept out by blade, oscillating at about 22 Kc, a frequency beyond range of audition. On collapse of these cavities it is stated, instantaneous local pressures of the order of 30,000 psi. are built up. This is basis of machine's efficiency. Although there is still some doubt as to what actually causes dispersion, it is certain that cavitation plays main part and that other effects are secondary.

All parts in contact with liquid are of corrosion-resistant alloys.

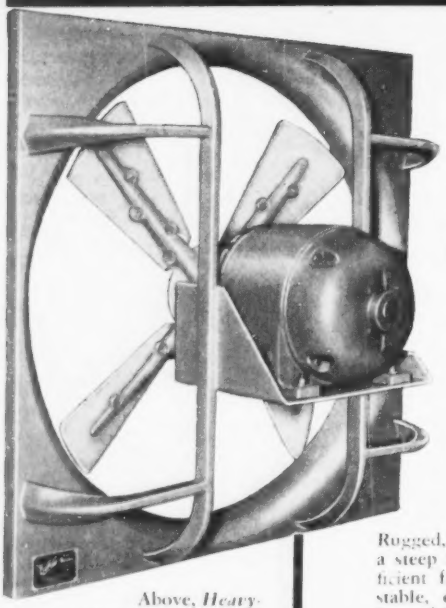
Vibrating elements can be dismantled by hand and cleaned in a minute or two. Filters ensures that foreign particles do not enter vibrating element.

Resonant bell is of special shape to disperse vibrations through medium while passing through machine. It can be instantly detached for blade adjustment.

Electric motor is of special design to run in any position from horizontal to vertical. It is 2 h.p., totally enclosed and has a light-weight alloy casing. Standard mounting is a special clamping device for side of vessel or suspension over vessel. Standard electrical supply is 400-440v. 3-phase 50 cycles, but motors for other cur-

BUILT TO HANDLE MORE JOBS BETTER!

These Husky New "Buffalo" DISK FANS



- Many sizes, to 90,000 cfm!
- Free Air or pressures to 1"!
- Easily installed "packages"!

With the development of this improved and broadened line of "Buffalo" Propeller fans, it is now possible to handle many additional ventilating and exhausting jobs with these fans at lower first cost and lower cost installation.

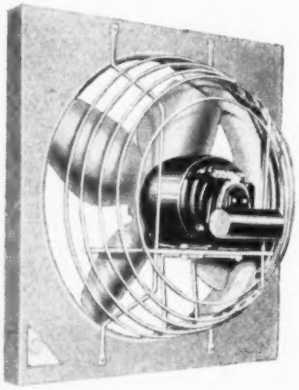
Above, *Heavy-gauge 4-bladed wheels for safe operation at tip speeds up to 13,000 fpm are characteristic of the sturdy construction of Heavy-Duty "NV" Propeller Fans.*

The HEAVY-DUTY TYPE "NV"

Above, is built in 24", 30", 36", 42", 48" and 54" sizes, direct or v-belt drive, for free air delivery or against system resistances as high as 1". Fans may be had with special protective coatings, stainless steel wheels, hard aluminum, Non-Sparking Everdur wheels for handling fumes with moisture, acids, alkalies and various gases. Models for high or low ambient temperatures are available. WRITE FOR BULLETIN F5790.

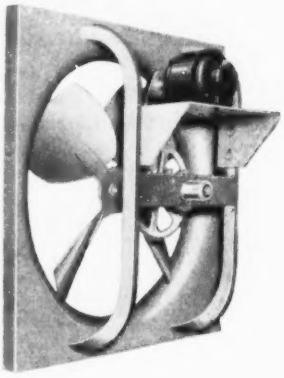
NV-BREEZO "Diamond Jubilee" Fans

Rugged, attractive and eye-appealing, this fan has a steep pressure characteristic combined with efficient free-air performance! Thus, you can get stable, efficient and high capacity performance from this fan in simple wall installations or ventilating systems with ¼" to ½" s.p. The rigid, welded motor-side wire guard is also a firm motor support. May be had in protective coatings, Stainless Steel, #3S Aluminum or Everdur brass for corrosive and/or explosion-proof applications. 8" to 24" sizes. WRITE FOR BULLETIN 5865.



The 24", 30" & 36" BELT-AIR is a top performer from any angle!

Its new sleeve bearing on the fan shaft permits fan operation at any angle from vertical to horizontal, shaft up, and provides quieter vertical shaft operation than ball bearings. Other major design changes provide higher capacities at lower, quieter speeds, and lower power consumption, also as a lay-down unit with motor and bearing assembly on discharge side. Also new Beltairs available in larger sizes 42" thru 84". This line effectively covers ranges from 5000 to 90,000 cfm. One of the units on this page may be just the economical, satisfactory fan you're looking for—WRITE FOR ENGINEERING DATA NOW!



DIAMOND JUBILEE 75 YEARS ANNIVERSARY

"Buffalo" FIRST FOR FANS

BUFFALO FORGE COMPANY

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PUBLISHERS OF "FAN ENGINEERING" HANDBOOK

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VENTILATING | PRESSURE BLOWING | AIR CLEANING | COOLING | AIR TEMPERING | HEATING | INDUCED DRAFT | FORCED DRAFT | EXHAUSTING

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rents will be quoted if so requested.

Pump incorporates a by-pass which can be hand-operated to adjust pressures at pump or output of machine. Valve can be fully opened and whole output of pump recirculated if desired. This feature is valuable in dealing with emulsions of varying viscosities.

Suction and delivery pipes are of solid drawn stainless steel and are supplied in standard length of 2 ft. 6 in. Shorter or longer lengths can be made to suit clients' requirements. All parts are finished in polished stainless steel with exception of motor, pump and clamping device which are in cream stove enamel.—*American Ultrasonics Corp., 198 Pacific St., Newark.*

Circle 147C on Reader Service Card

Hand-Truck Wheels Resist Corrosion

In plants where excessive moisture, oils, acids and alkalis exist, resistance to corrosion is claimed for new hand-truck wheels.

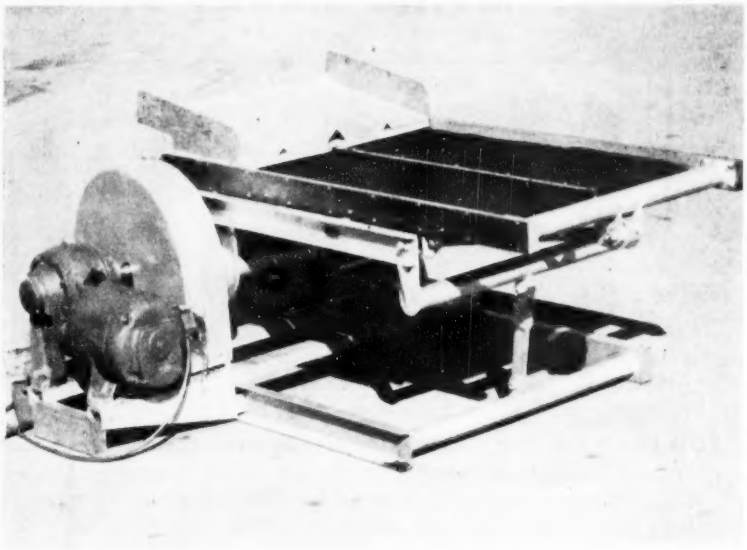
Wheel consists of a cushion Neoprene tire which is permanently bonded to a fibre-impregnated hard rubber core and a sealed tapered roller bearing.

Neoprene-hard rubber core combinations have been tested and are still in use after 5 yr. service in packinghouses where floors are normally wet and oily and where salt brine and extreme temperatures all combine to make short work of wheels.

Completely sealed tapered roller bearing recently added, provide anti-friction operation under both radial and thrust loads. Die cast, screw-on type hub caps have Neoprene seals and keep moisture and dirt out of bearing.—*St. John and Co., 5810 S. Damen Ave., Chicago 36.*

Circle 149A on Reader Service Card

New Grape Stemmer Has High Output



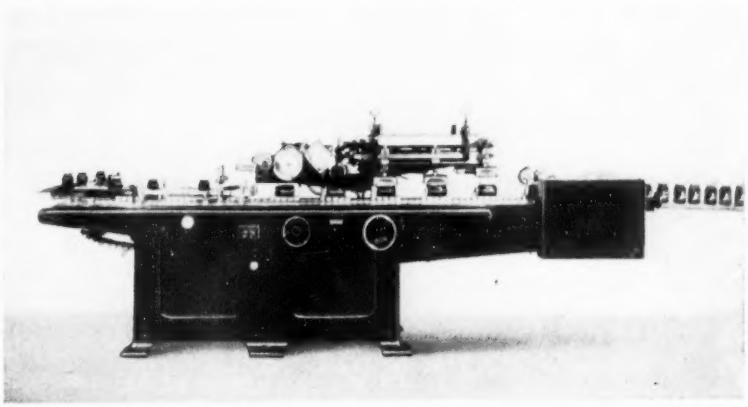
High stemming efficiency and minimum maintenance are claimed for this new grape unit.

There are 112, ⅝ in. dia., rubber covered rolls in stemming bed mounted transverse to direction of fruit travel. Intermittent reversal of roll rotation agitates fruit which results in high stemming efficiency, as well as rolls that are self cleaning.

Even progression and gentle handling of fruit is accomplished by reciprocating roll bed at a higher velocity during return stroke than on forward stroke.—*Magnuson Engineers of San Jose, Calif.*

Circle 149B on Reader Service Card

Automatic Labeler Has Wide Size Range

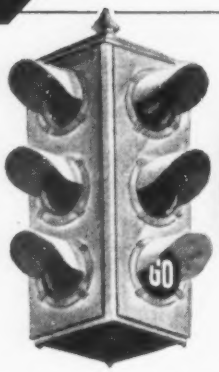


This new automatic labeler is a continuous-motion straight-line machine that has a speed of up to 120 containers a minute and offers an exceptionally wide size range, according to makers.

Unit will label a gallon jug and a 4-ounce bottle. It can be manually and/or automatically fed. Method by which label is applied permits containers to be dry or moist, hot or cold, without affecting firm sealing. Almost any label can be used—rectangular, round or fancy cut; in paper, foil or glassine. Labels may be applied to recessed bottles and containers of unusual shape—a glass mug, tumbler, salt-and-pepper bottle. —*Package Machinery Co., East Longmeadow P. O., Springfield, Mass.*

Circle 149C on Reader Service Card

STOP WASTING MONEY BY THE TRUCKLOAD



Go White!

YOU NEED the most efficient kind of delivery trucks for today's operating conditions.

That's why so many leading firms say "Go White" for today's finest kind of delivery service.

Tailored to the exact needs of your business for more deliveries per day . . . lower cost per unit delivered . . . the new Whites save time and cut costs in every phase of delivery service.

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White 3000

For more than 50 years the greatest name in trucks

LOW-BED FRAME DESIGN

Saves reaching, stretching and straining

CAB SAVES STEPS

Driver saves time and energy on every delivery

EXCLUSIVE POWER-LIFT CAB

Saves inspection and maintenance time and cost

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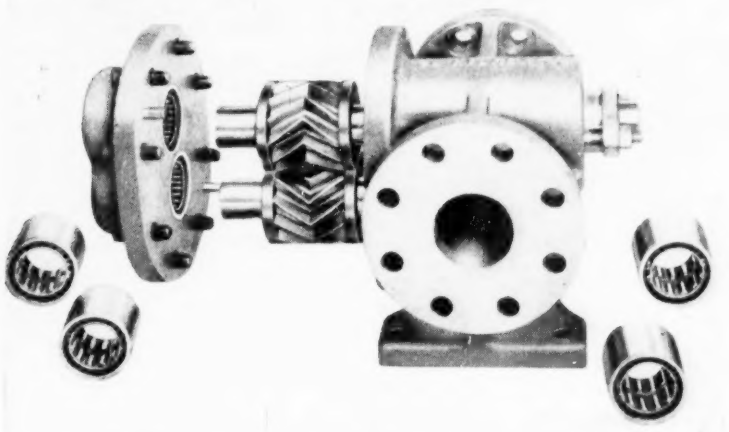
Rotary Gear Pump For Viscous Liquids



Simplified design of new rotary gear pump is claimed to make possible high quality with economy.

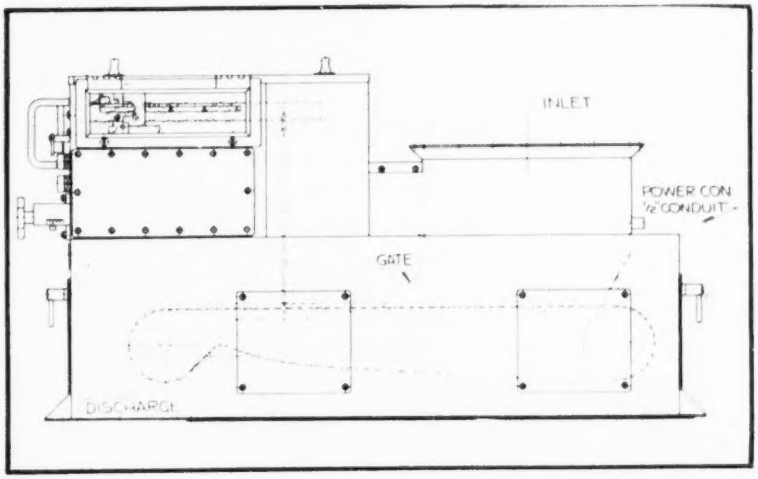
Indicative of design: Only two castings are used—for the body and head; there are only two moving parts—two rotors; no inner races are needed in bearings—shafts are hardened and ground at bearings; only one stuffing box is used (under suction pressure).

Additional features reported are as follows: Rotors are precision made gears; pumps are hydraulically balanced axially; shaft is hardened and ground at stuffing box, which minimizes wear; heavy duty roller bearings are used; all connections over 2 in. are flanged; all machined surfaces are ground for easier piping and aligning.

Primarily for positive displacement of lubricating liquids, Hydrex pump will handle fluids and semi-fluids, 32 to 250,000 SSU. Capacities are 1 to 500 gpm.; 300 psi. for continuous duty, 500 psi. for intermittent service. —*Sier-Bath Gear and Pump Co., Inc., 9252 Hudson Blvd., North Bergen, N. J.*

Circle 151A on Reader Service Card

Feeder's Rate Constant, Flow Continuous



An uninterrupted flow of material at fixed rates up to 3,000 lb. per min. is delivered to processing equipment by a new new solids feeder.

In operation, constant-weight continuous feeder receives material through a large inlet (see sketch). Product drops onto conveyor belt which carries it past a regulating gate, over a scale mechanism and out a discharge opening at bottom of feeder.

Regulating gate, which can have either a sharp or involute edge, automatically controls depth of material moving on belt, providing constant-weight delivery. If weight of material passing over weighing section varies, gate automatically adjusts to allow more or less material to pass. Amount of product delivered during any 2-min. run varies in weight less than plus or minus one percent.

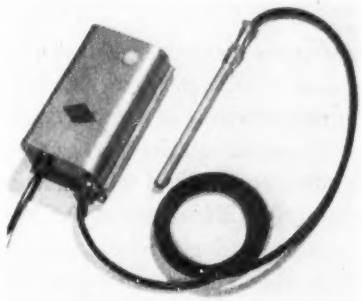
Electrical equipment meets Class II Group G safety requirements for hazardous dusts. For ease of maintenance, access doors are provided in dust-tight housing.

A counter on side of feeder records in hundredths-of-a-minute duration of any run. To get total amount delivered you multiply this reading by beam poise setting which is in lb. per min.

Feeder comes in two models. One has a 9 in. stream width and will handle from 75 to 1,500 lb.; other has an 18 in. stream width and will handle from 150 to 3,000 lb. per-minute.—*Richardson Scale Co., Clifton, N. J.*

Circle 151B on Reader Service Card

Electronic Unit Provides Liquid Level Control



Adjustment of liquid level, and cut-in, cut-out differential over wide limits are provided with a new electronic unit, design of which is based on capacitive action of liquid surrounding a porcelain-enamel-covered electrode.

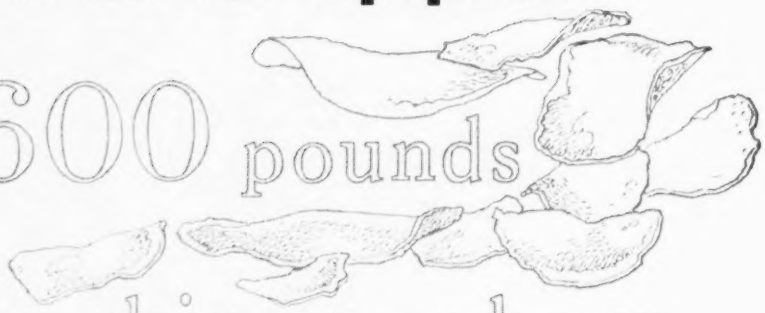
In operation, new Belmont level control consists of a probe mounted directly at location of controlled

Want More Information?

It's free—and easy to get. Simply note here the items on which you want more details, then circle each key number (there's one given at the bottom of each item) on the handy Reader Service postcard—page 201. Then sign at the bottom and mail.

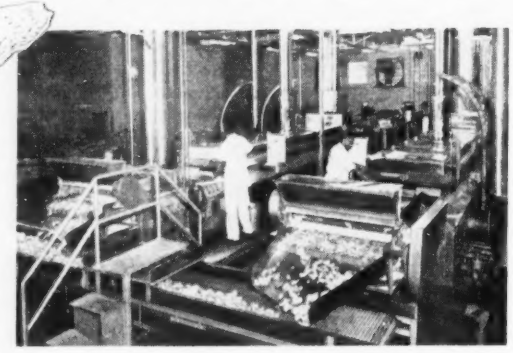
For your convenience, too, items in this department are listed and keyed in the Reader Service Section.

modern GAS equipment



fries 600 pounds of potato chips per hour

at Morton Foods plant, DALLAS, TEXAS



At Morton Foods' new plant in Dallas, the most modern GAS equipment available is used for the manufacture of potato chips. The modern GAS machine and its storage tank contain 3500 pounds of cottonseed oil, which Gas-fired tubes, immersed in the oil, heat to 350° F. Each tank in the processing machine contains five heating tubes, which are controlled automatically, shutting GAS off whenever flue motor stops.

Temperature of the cooking pan bottom is so controlled that it is never overheated. This prevents carmelization of chips which fall onto it. An automatic filter permits filtering of hot oil through the storage tank, and immediate return to the cooking vats, and simplifies evening clean-up.

This Modern GAS Volume Food Processing Equipment, made by MacBeth Engineering Corporation of Harrisburg, Pa., is typical in its performance of the service you can expect from GAS. Gas is clean, Gas is versatile in application. Temperatures are controllable exactly for critical food processing. Get the facts from your Gas Company Representative.

MORE AND MORE THE TREND IS TO GAS FOR HEAT PROCESSING OF FOODS

AMERICAN GAS ASSOCIATION

420 LEXINGTON AVENUE, NEW YORK 17, NEW YORK

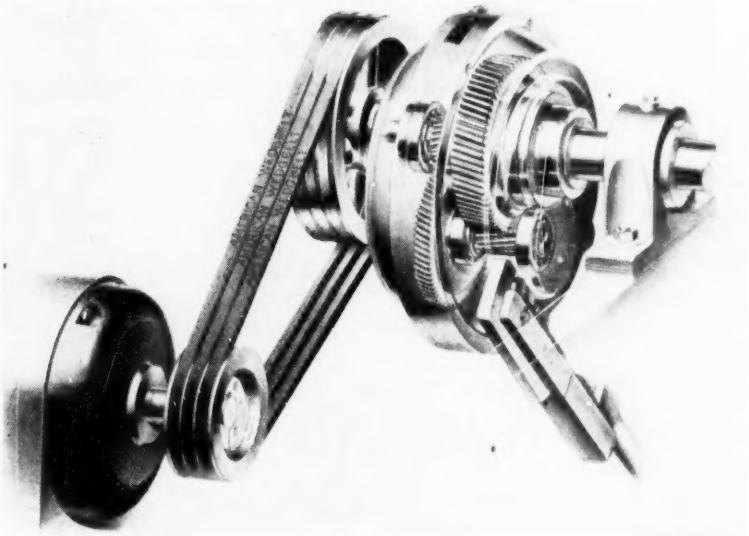
liquid; a connecting cable which can be 1,000 ft long, and control unit. Long cable permits easy location of unit for operating convenience. Two main controls—liquid level and differential—are designed for screwdriver adjustment, while a vernier or fine control on liquid level is operated by a panel-front knob.

Differential range varies with type of service. For example, in ammonia control, standard unit operates between approximately 1 and 5 in. Wider ranges can be supplied with special units. Among applications of new unit are low-side refrigerant-level control in refrigeration plants; filler, measuring, and mixing controls required in these operations in food processing plants.

Standard models operate from 115v., 60 cycles supply. Special units also are available for 230v. or 25 cycles operation. Included in unit is a snap-action relay rated for 10 amp. at 115 and 230v. An indicator light in panel front shows operation of relay, burning at full brilliance when relay is open and at half brilliance when relay is closed.—*Thermo Instruments Co., 1166 El Camino Real, Belmont, Calif.*

Circle 151C on Reader Service Card

Speed Reducers Have Many New Features



Improvements in gears, bearings, housing, lubrication and oiling systems are reported for a new series of 20.1 ratio speed reduction units.

Gearing in new speed reducers consists of two trains of the single-helical type. Gears are precision cut from alloy steel forgings and are flame-hardened.

Exclusive feature of new reducer construction is use of both ball bearings and tapered-roller bearings where each can be utilized most effectively. Longer bearing and gear life is made possible by three-wall housing.

Gearing and bearings are continuously splash-lubricated by high-speed gear and counter-shaft pinion running in a large oil reservoir in lower third of housing.

Concentric shaft design places both input and output shaft above oil level. Therefore, bearing seals do not operate against a head of oil. Additional feature is a leakproof, antifriction oil-sealing system.

Interchangeable patented split tapered bushings with locking nuts eliminate fretting-corrosion and make units immediately adaptable to any shaft size up through 3-15/16 in. Speed reducers are easily mounted directly on shaft of driven machine and require only standard shaft lengths (twice shaft diameter plus clearance) for mounting.

As protection against shock, jam or built-up loads, reducers can be equipped with the maker's torque-arm overload release.—*The American Pulley Co., 4200 Wissahickon Ave., Philadelphia 29.*

Circle 153A on Reader Service Card

Compact Device Affords Controlled Sprinkling

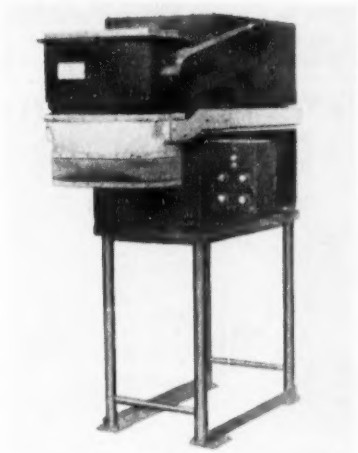
Of interest to dairy operators, bottlers and other food processors is new device which provides automatically controlled sprinkling.

Called Liquid Tender, it measures a pre-selected amount of liquid as water, milk, syrups, then automatically shuts off. Handy selector dial on the tender determines flow of liquid from 5 min. to 4 hr. A push-button restarts action again if needed.

Rustproof materials are used throughout and tender has no gears or clock to jam or stop.—*Luthe Corp., 206 W. Washington St., Milwaukee 4.*

Circle 153B on Reader Service Card

Automatic Unit Provides Fast, Accurate Filling

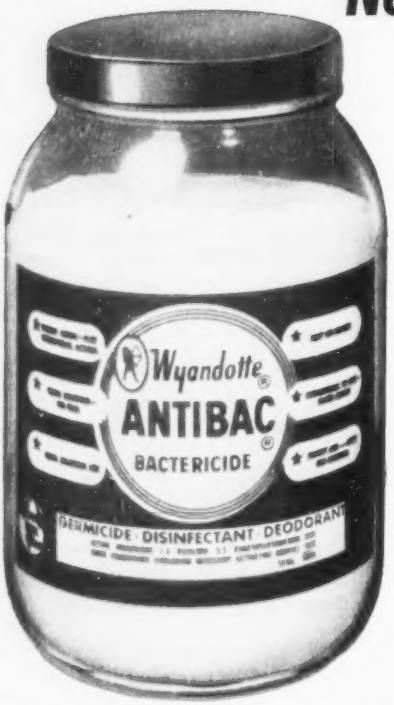


Designed specifically for use with light "flooding" materials difficult to handle, this new Model 600G filling scale automatically holds fills, checkweighs and releases up to 6 bags of material a minute. Weight tolerances is plus or minus 2 oz. or less of any desired weight from 25 to 200 lb.

ANTIBAC

(Exclusive with Wyandotte)

Now Available–The FIRST and ONLY MILDLY ACIDIC SANITIZER!



- Mildly acidic — faster germicidal action
- Clear solution — no film
- Longer solution life
- Easy on hands
- Economical to use — saves labor
- Handy jar — aids use-control

Antibac's fast, sure, powerful killing action is not smothered with alkali.

Antibac* is the *only* chlorine sanitizer available that is actually *mildly acidic*. It puts more active chlorine to work, maintains unusual effectiveness even when solutions become contaminated.

Yet Antibac is gentle, *easy on the hands.* Ask for a demonstration. *Wyandotte Chemicals Corporation, Wyandotte, Michigan; also Los Angeles 12, California.*

*REG. U.S. PAT. OFF.

ANTIBAC—the result of years of specialized research and a new, patented manufacturing process. ANTIBAC is powerful and quick-acting, yet retains longer storage and solution life!

Wyandotte CHEMICALS

Helpful service representatives in 138 cities in the U.S. and Canada

IF YOU TRY ANTIBAC—YOU'LL *BUY* ANTIBAC! HERE'S WHY!

Instantly soluble — Note how you can read the jar label through the solution! ANTIBAC is completely and instantly soluble in hot or cold water! Leaves no films, streaks or residual deposits! Kills odors . . . leaves no odor of its own!

Greater killing power — ANTIBAC kills instantly — both ordinary bacteria and tough, heat-resistant bacteria! It has the fastest germicidal action known for chlorine sanitizers. ANTIBAC solutions withstand high use temperatures. ***You also use less!***

"Control" packaged—4-lb. jars, 4 to a case, easy to handle and store—provide use control and inventory control. ***Antibac* is economical;** you actually use less and it retains its killing power for longer periods in solution or dry form.

LARGEST MANUFACTURERS OF SPECIALIZED CLEANING PRODUCTS FOR BUSINESS AND INDUSTRY

Features claimed for unit are an air-operated bag-holder, dust-tight construction, shock-proof leverage system which employs no wear-vulnerable knife edge pivots, and a combination gravity and rotary feeding system.

As start of feeding operation, bulk of material to be weighed, 95 percent is fed into bag by gravity and, if dictated by nature of material, compressed air. Remaining 5 percent is then slow fed by a positive feed device until bag reaches predetermined weight. At that moment, feed gate automatically seals tight and checkweighing lights indicate that bag is filled. Then, if bag weight is within pre-set tolerance, it is automatically dropped or, optionally, held for push button release by operator.

Bag holder has been specially designed for powdered materials. Dust tight operation throughout filling phase is maintained by a collector spout which extends from bag holder to carry off all dust-laden air. Holder design provides space above bag for use when filling with materials which must be aerated. A timer, available as optional equipment, allows a few seconds for settling before bag is released.

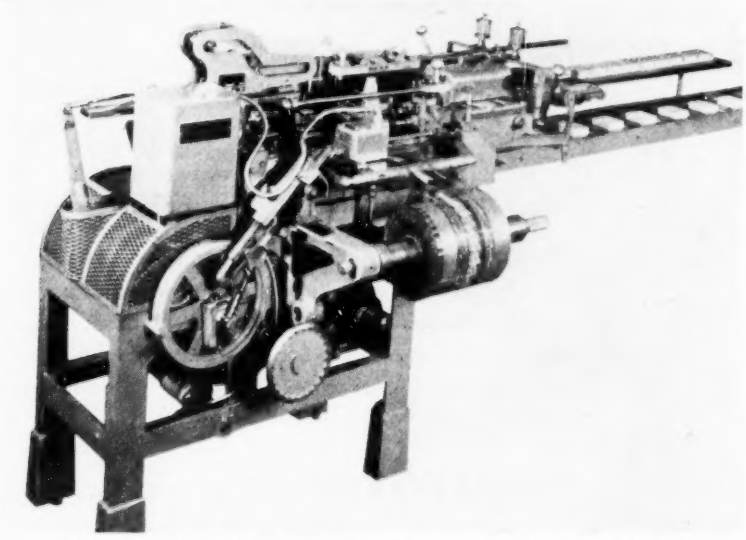
For applications where both bags and drums (up to 200 lb.) are to be filled, a steel platform is available especially designed for use with scale.

To provide minimum maintenance, all movable shafts are carried by double-sealed and grease-packed ball bearings. All mechanical and electrical points are carefully sealed in dust-proof housings.

Overall dimensions of scale and feeder are 2 x 2 x 3 ft. Scale stand if desired, may be furnished with casters and locking screws.—*Thayer Scale and Engineering Corp., East Water St., Rockland, Mass.*

Circle 153C on Reader Service Card

Wraps 20 to 50 Packages Per Min.



Tightly wrapped packages at the rate of 20 to 50 per min are reported with use of this new wrapping machine.

Unit folds wrapping material around product carried forward over rubber rollers that can be set to squeeze package to insure a tight wrap. At same time, package is pressed to eliminate any air space between product and wrapping material.

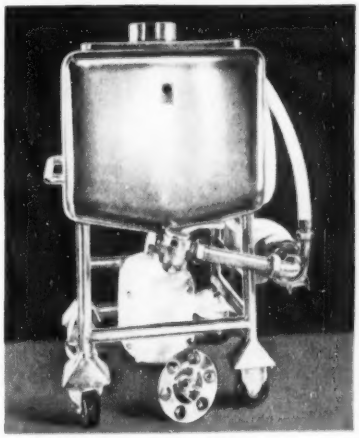
End folds of package are V-type underfold and pressed against bottom of package in a neat, moistureproof fold. Underfold feature makes machine particularly applicable for meat packaging. End folds are completed and sealed while package is held securely in position.

Machine wraps produce on flat cards, on scored cards, U-boards or trays. It is easily adjustable, and available in various models, capable of handling packages 3 to 24 in. long, 2 to 11 in. wide and 1/-16 to 2½ in. high.

Machine is equipped with electronic control, for positive registration of printed wrap on package.—*Hayssen Mfg. Co., Sheboygan, Mich.*

Circle 155A on Reader Service Card

High Speed Mixer For Viscous Items

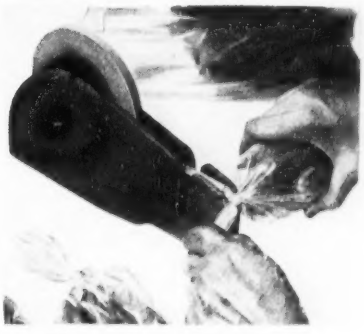


Thorough blending of a 50 percent mixture of liquid and powder is said to be accomplished in minutes by this Norman mixer—a high speed, stainless steel unit. Uses include mixing of such products as yeast, milk powder, eggs and mayonnaise.

Unit is similar in design to standard laboratory blender, but is manufactured of stainless steel on a larger scale. Mixing action is accomplished by a six-fluted agitator driven directly by a 1,750 rpm. motor.

Standard capacities are 8, 15, 25, 50 and 75 gal. Both stationary and mobile units can be supplied. Laboratory facilities are available for testing new products.—*Cherry-Burrell Corp., 427 W. Randolph St., Chicago.*

Circle 155B on Reader Service Card



For Fast Prepackaging

Plastic and paper bags used by prepackagers of produce can step up their hand operations with use of new sealer. Two quick motions and bag is sealed tight. Unit is made of cast iron and mounted on 3-nonskid rubber feet.—*Tri-Pak Machinery Service Inc., Harlingen, Texas.*

Circle 155C on Reader Service Card

These S-M-O-O-T-H Tube Walls Help Keep the "Fizz" in Soft Drinks

The maker of these carbonating units for automatic soft drink dispensers wanted the sanitary features of stainless tubing.

But the stainless tubing had to be more than "stainless".

They needed perfectly smooth I.D. tube surfaces, so that carbonated water would not be subject to turbulence and thus lose its "fizz".

Carpenter tubing met all requirements and, in addition, was supplied promptly from distributor stocks.

When you want the sanitary advantages of stainless, put in a call to your Carpenter Stainless Tubing Distributor. You will secure not only the highest quality stainless tubing, but also the engineering and fabricating help that keeps processes going the way you planned them.

THE CARPENTER STEEL COMPANY
Alloy Tube Division, Union, N. J.

Export Dept.: The Carpenter Steel Co., Port Washington, N.Y. "CARSTEELCO"

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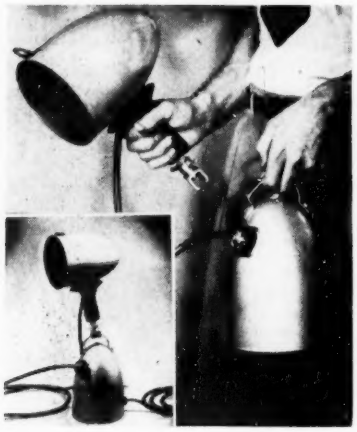
Black-Light Hand Lamp Simplifies Inspections



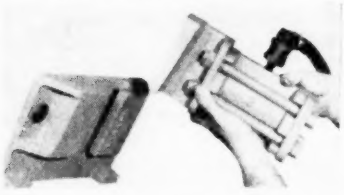
Industrial and agricultural inspections can be readily made with this portable, black-light lamp.

Various types of decay and contamination fluoresce naturally. Oil leaks in machinery can be readily checked with unit because under activation by ultra-violet slightest trace emits a glow. This Model B-50-H Mineralight is a 100 w. long wave ultra-violet hand lamp operating on 110 v. ac. current. It throws a beam (13,660 A.U.) ultra-violet up to 30 ft. away, will clamp rigidly to its non-tip base (containing transformer), and may be permanently locked to any desired position. Unit has easy-to-grip plastic handle, heavy 3-conductor primary and secondary cords. Radiation is stated to be non-injurious.

Unit is made of light-weight, strong spun metal, finished in gray hammertone baked enamel. Matching hood and base fully enclose bulb and transformer. Both bulb and filter are safetly recessed in hood, and switch is conveniently located at base of lamp. —*Ultra-Violet Products, Inc., 145 Pasadena Ave., South Pasadena, Calif.*

Circle 157A on Reader Service Card

Easy Portability Marks Compact Air Vibrator



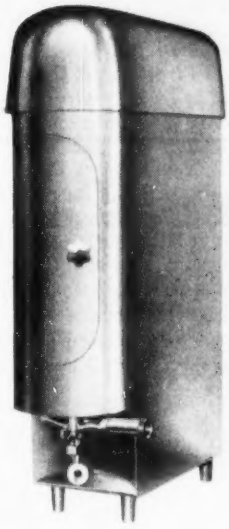
A practical means of eliminating arching, bridging and sticking conditions in bins, hoppers, chutes, and other equipment carrying granular materials is provided with use of new 2 in. piston diameter air vibrator, the LSRR.

Feature of unit is its quick, easy portability. Cast steel male bracket on unit fits snugly into female bracket and steps up unloading of materials having a tendency to pack down. Unit starts and stops instantaneously and is termed ideal on applications where one vibrator can serve several bins.

Overall dimensions are: Length, 10 in.; height, 5 in.; width, 5½ in. Weight is 30 lb. Female Bracket—Overall Width, 11 in.; Height, 7½ in.; Thickness, 2½ in.—*Cleveland Vibrator Co., 2828 Clinton Ave., Cleveland.*

Circle 157B on Reader Service Card

Unit Removes Sediment From Ice Cream Mix



Effective removal of sediment from ice cream mix by centrifugal force is reported made possible with the Super Mix Clarifier recently introduced.

White, unflavored ice cream mix is reported quickly clarified at pasteurizing temperatures with this new machine. On basis of Connecticut Official Milk Sediment Standards of 1931 (0 for clean, to 500 for dirty milk) all clarified ice cream mix scores 0 in sediment rating. These results, maker states, have been proved by extensive production tests in several independent ice cream plants.

With use of unit, quality-conscious ice cream producers, are provided sediment removal without impairing mix formula. Ingredient losses are termed negligible.

Machine's simplified tubular bowl can be cleaned, sterilized, and reassembled in 10 min.—*Sharples Corp., Dairy Equipment Div., 2300 Westmoreland St., Philadelphia 40.*

Circle 157C on Reader Service Card

Rotameter Indicates Small Fluid-Flow

Where small, low-cost flow meters are needed, this new purge rotameter will indicate and manually control small flows of fluids with good reproductibility but moderate actual measuring accuracy, state makers.

Typical applications include indication of: flow of supply air in bubbler type liquid-level measuring installations; flow of purge fluid, generally water or air, in pipelines connecting orifices, venturi tubes, or nozzles to differential head flow meters; flow of transparent purge fluid to sight glass indicators of rotameters measuring flow of opaque fluids.

Rotameters are small size variable area type flow meters for low flow ranges. Rate of flow of fluid passing through meter is indicated by position of a ball float moving in tapered glass meter tube vertically installed in meter. Rate of flow is read in reference to center of ball float on a scale mounted alongside of meter tube.

Check valve prevents back flow of process fluid into purged apparatus if pressure of process fluid should exceed that of purge fluid or if meter tube is removed from meter body. A flow control valve gives sensitive control of fluid flow through meter over entire range of meter at differential pressures between 1 to 100 psi. across control valve. Rigid one-piece

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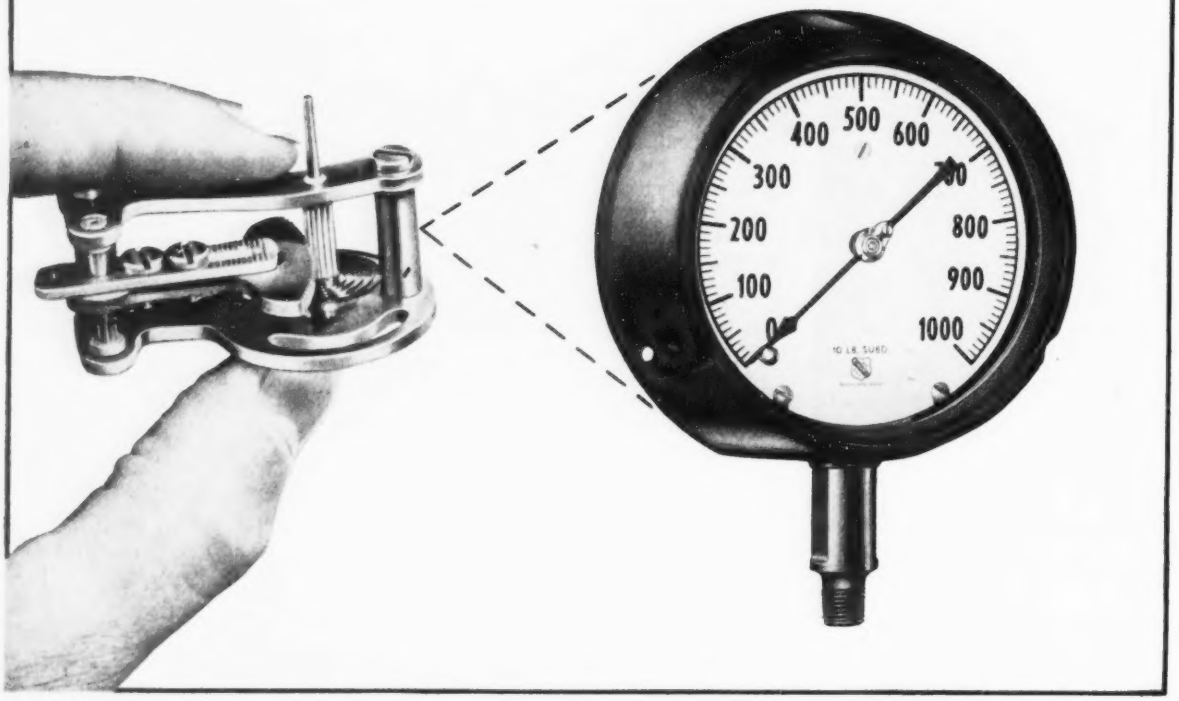

ASHCROFT DURAGAUGE WITH *Nylon Movement**

Nylon is light, strong, highly resistant to frictional wear. It absorbs vibration and doesn't corrode. It is dimensionally stable under high temperatures. That's why the bearings and pinion gear in the Ashcroft Duragauge movement are made of nylon. Mated with stainless steel parts and incorporating the rotary gear principle used in the finest watches, the result is a pressure gauge that gives longer service, sustained high accuracy and greatly improved sensitivity of indication.

The enduring dependability of precision-built Ashcroft Duragauges with Nylon Movement has been proved in the most "killing" services. Petroleum refineries, chemical plants and power stations know from experience that they *outlast all others*. So — if you want accurate pressure indication or recording to insure maximum safety, product quality, or cost control — install Ashcroft Duragauges. Your nearby Ashcroft Distributor will gladly help you select the proper Duragauges for your applications.

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Centralize Your Purchasing. Take advantage of the simplified buying procedures, low inventory investment and fast delivery service made possible by the facilities of your local Industrial Supply Distributor. Remember, he stocks hundreds of top-quality items and is your most reliable source for data on all that's new in time and money-saving products and methods.

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For more information, use coupon on page 201.

meter body stands rough handling in pipe installations and effectively protects glass meter tube.

Rotameters must be installed in a vertical position. They can be installed directly in pipelines, on instrument panels or in instrument cases. Delivery of meters are available immediately from stock.—*Schutte and Koerting Co., Cornwells Heights, Bucks County, Pa.*

Circle 157D on Reader Service Card

New Chemicals

Material Binds Dust Of Concrete Floors

Control of dust on concrete floors is aided with use of a new product known as Transvar 266.

Expressly designed for this purpose, product is claimed to have shown excellent results in binding together tiny dust particles that are actually a part of concrete surface. Such dusting is first sign of a surface disintegration and if allowed to continue, can result in serious and costly future floor problems. Material may be applied by brush or even a mop.

It is a thin liquid, light amber in color but does not alter appearance of surface due to penetration of pores. No surface film is formed.—*United Laboratories, Inc., 16801 Euclid Ave., Cleveland 12.*

Circle 159A on Reader Service Card

Weigh-Tank Sampler Is Fast, Accurate

Regardless of tank design or age, every sample drawn for butter fat tests by a new labor-saving, weigh-tank sampler, the Vacu-matic, is reported accurate.

Agitating milk in weigh tank with filtered air, unit keeps milk out of suck line until fast sampling cycle begins. Touchdown action on sample bottle starts unit in operation. After sampling, milk is quickly returned to weigh tank under pressure. Vacu-matic contains its own pressure and vacuum pump; no auxiliary equipment is necessary.

Made of stainless steel and nickel alloy, is ruggedly constructed with only one precision part and provides trouble-free service.—*Langsenkamp-Wheeler Dairy Supply Div., 1266 Shelby St., Indianapolis 3.*

Circle 159B on Reader Service Card

New Baker's Emulsifier Tenderizes Products

A new bakery ingredient—called Brosoft—is reported to produce tenderness of crumb and crust.

Material is claimed to have high powers of emulsification and dispersion resulting in activity for combining shortening and water and other ingredients of dough. It improves texture and keeping qualities, and makes for easier slicing, according to maker.

New ingredient contains flour, mono- and di-glycerides, vegetable oil, lecithin and associated phosphatides (vegetable emulsifier), and salt.

It is a dry product packed in 100 lb. laminated paper bags. Its use requires no changes in shop procedures. *Brolite Co., Inc., 2542 Elston Ave., Chicago.*

Circle 159C on Reader Service Card

General Purpose Cleaner Is Highly Effective

Economy and efficiency are claimed for new all-purpose cleaning concentrate known as Lift-X. Material incorporates Neutrol, an effective deodorant, and Pol-Amo, a new organic agent giving effective bacterial control.

Material is a formulation of synthetic detergents, wetting and buffing agents and results in a product so concentrated it may be diluted as much as 100 to 1 for ordinary cleaning jobs.

To obtain full benefit from extra concentration built into material user should experiment to find a maximum dilution possible for any specific job. Use of warm or hot water for mixing will somewhat increase effectiveness and make possible greater dilution. If solution is allowed to stand on surface several minutes before cleaning job is completed it will be easier to remove ground-in dirt, grease, and stains.—*Lift Products, Inc., 409 1st St. S.E., Cedar Rapids, Iowa.*

Circle 159D on Reader Service Card

Cans Cooked or Not? Paint Will Tell

Of interest to canning plant operators is new heat-indicating paint called Formula X-13, light blue in color.

When applied to a plain tinplate surface, blue to white color changes occur in approximately 8 to 12 min. at 240 deg. F., or 4 to 6 min. at 250 deg. F., in steam atmosphere. Material is reported having no objectionable odor, non-poisonous and non-corrosive. Use of paint minimizes chance that crates or trucks of cans might slip through processing lines without actually being subjected to processing.

Where cans are scrambled in retort crates following closing, paint is applied to several of bodies of cans which are in plain view on top of crate. Thus retort operators need only to glance at crates to see whether or not contents have been processed.

Further checks can be made along line in case unprocesses cans may get beyond retort room. When caught in warehouse a sample is usually cut open to confirm a "missed cook." Crate can then be returned to processing line, eliminating possibility of remaining in crates labelled and cased, and shipped along with processed cans.

Developed in conjunction with National Can Corp., it is manufactured by—*Easterday Paint & Chemical Co., Racine, Wis.*

Circle 159E on Reader Service Card

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In Behalf of Progress . . .

NRC Has Cures for What Ails Standards Hearings

Long delays and excessive expenditures have been needless burdens in many of the federal food standards hearings.

Now from an unexpected source come two proposals for eliminating much waste of time and money. And food engineers and executives ought to press vigorously for acceptance of the recommendations.

To expedite hearings, National Research Council's Food & Nutrition Board makes these suggestions:

1. Take entirely out of food standards procedures the controversial review of safety requirements regarding new intentional chemical additives.

2. Permit adoption or amendment of food standards without hearings when no protest arises after public announcement of the proposal of such changes.

It will not be altogether easy to make these two radical shifts in procedure. But they most certainly are needed.

It is high time that the matter of preparing a standard of identity for a food be made a more prompt, effective, and economical operation.

Many parts of such standards can be agreed to "by stipulation." Then a standards hearing can be limited to those questions on which there logically and properly is some difference of opinion.

But even more benefit can come from the idea of independent proceedings on the question as to what is safe from the standpoint of diet.

This matter is one for the nutritionists and medical specialists, with assistance from the research laboratories. Results of such procedure are not made effective by the legalistic standards proceedings of the recent past. The safety investigations should seek facts and should not be allowed to become an opportunity for trade controversy or the development for inter-food competitive arguments.

We believe that the food industry—and individuals and companies in the industry—will profit greatly by the prompt adoption of the two Food & Nutrition Board recommendations.

Fewer and Bigger Plants—Chart Tells Vital Story

It is no secret. For some time there has been a trend toward fewer but larger and more efficient food plants.

But when you see this trend portrayed graphically, the effect is dramatic. Take a chart issued by the Bureau of Agricultural Economics. It shows percentage change in number of dairy manufacturing plants and output per plant.

Covering 1939 to '51, this graph shows fewer plants by 40 percent for butter, 30 for cheese, 15 for evaporated milk, and 25 for ice cream.

Conversely, it pictures a 10 percent gain in output per plant for butter, 135 for cheese, 60 for evaporated milk, and 140 for ice cream.

Only dry milk is being made in more plants—up 65 percent. And at the same time output per plant is up 60 percent.

Most of the plants closed in the 13-year period were among the smaller ones.

Here you have vital statistics of industrial progress—significant to small and larger plants alike.

Progress in all branches of our industry has been in the direction of lower unit production costs. There is no escaping this trend.

Larger operations, of course, have a better opportunity to reduce unit costs. One measure of this advantage comes from a study of 13 cooperative creameries by Iowa State College. This indicates that a butter creamery of 2,000,000-lb. capacity can operate at a cost of less than 4c. a pound. But a 200,000-lb. plant is faced with an 8 to 10c. operation.

As American Institute of Management puts it: The smaller firm has more trouble obtaining funds and maintaining credit, and is not as well equipped to control expenditures. Executive employees and rank-and-file personnel are more difficult to find and hold. Many small enterprises are kept from growing larger by their failure to adapt big-business methods, notably in such areas as research and development, cost accounting, depreciation, equipment policy, and corporate structure.

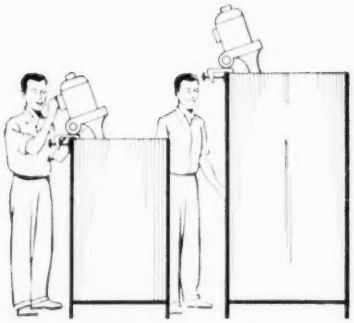
Small business is one of the mainstays of our economy and a keystone in American free enterprise.

But the relentless pressure of the economics of industrial progress necessitates high efficiency. The smallest food business of the future will be one large enough to use efficient methods—or one producing a high-priced specialty.

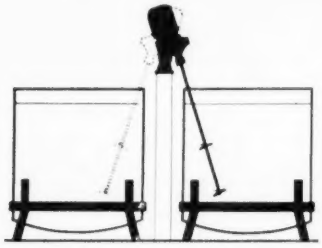
Among other things, small food plants therefore must equip themselves with technical personnel having advanced know-how.

If you can't keep a technical man busy, take the advice of a successful small bottler: Develop something more for him to do—syrup manufacture in the case of the bottler.

Then you'll have technical help on all operations.

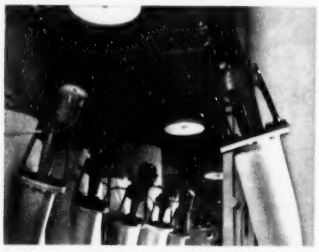


YOU CAN EXPAND batch size, and still use the same LIGHTNIN Mixer, if you plan now. In most cases, all you need do is add a longer shaft to handle the bigger batch.



YOU CAN MIX more batches with the same LIGHTNIN Portable Mixer, by mounting it between two tanks, and mixing them alternately.

YOU CAN ADD more mixing units of any size, at any time. Just clamp a LIGHTNIN Portable Mixer to the tank or kettle, hook up to power, and start mixing.



LIGHTNIN TOP ENTERING Propeller Mixers, for open or closed tanks. Sizes ¼ to 3 HP.

Get these helpful LIGHTNIN Catalogs

This library of mixing information is yours for the asking. Catalogs contain helpful data on impeller selection; sizing; best type of vessel; valuable installation and operating hints complete description of LIGHTNIN Mixers.

MIXCO fluid mixing specialists

COOKING PRESERVES with LIGHTNIN Portable Mixers.

Plan now for fluid mixing that saves money when you expand

Expansion-minded? Here are three tips that will save you plenty later on, when you're ready to step up production:

If you plan to increase batch size Use LIGHTNIN Mixers sized to handle not only your present batches, but the batch volumes you plan to have. Then when you switch to larger tankage, you can do it *without buying new mixers.*

If you want to handle more batches Remember you can make one LIGHTNIN Portable Mixer do the work of *two* mixers, by mounting it on a post or pedestal and changing containers as needed.

If you're going to add more mixing units, get the right LIGHTNIN Mixers in your stockroom *now.* Then, as the need arises, put a new mixing unit on line at any time. There's no extra assembling or construction work to do if you have LIGHTNINS.

This guarantee protects you Every LIGHTNIN Mixer is guaranteed to do the job for which it is recommended, or your money back. For quick help on fluid mixing, let us know the materials you are mixing and the results you want. Free facts—no obligation. Write us today.

Lightnin® Mixers

MIXING EQUIPMENT Co., Inc.

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In Canada: William & J. G. Greey, Ltd., Toronto 1, Ont.

- ☐ DH-50 Laboratory Mixers
- ☐ B-75 Portable Mixers (electric and air driven)
- ☐ B-102 Top Entering Mixers (turbine and paddle types)
- ☐ B-103 Top Entering Mixers (propeller type)
- ☐ B-104 Side Entering Mixers
- ☐ B-105 Condensed Catalog (complete line)
- ☐ B-107 Mixing Data Sheet

Please send me the catalogs checked at left

Name_____

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Company_____

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City_____ State_____

TURN PAGE FOR FOLDOUT FLOWSHEET →

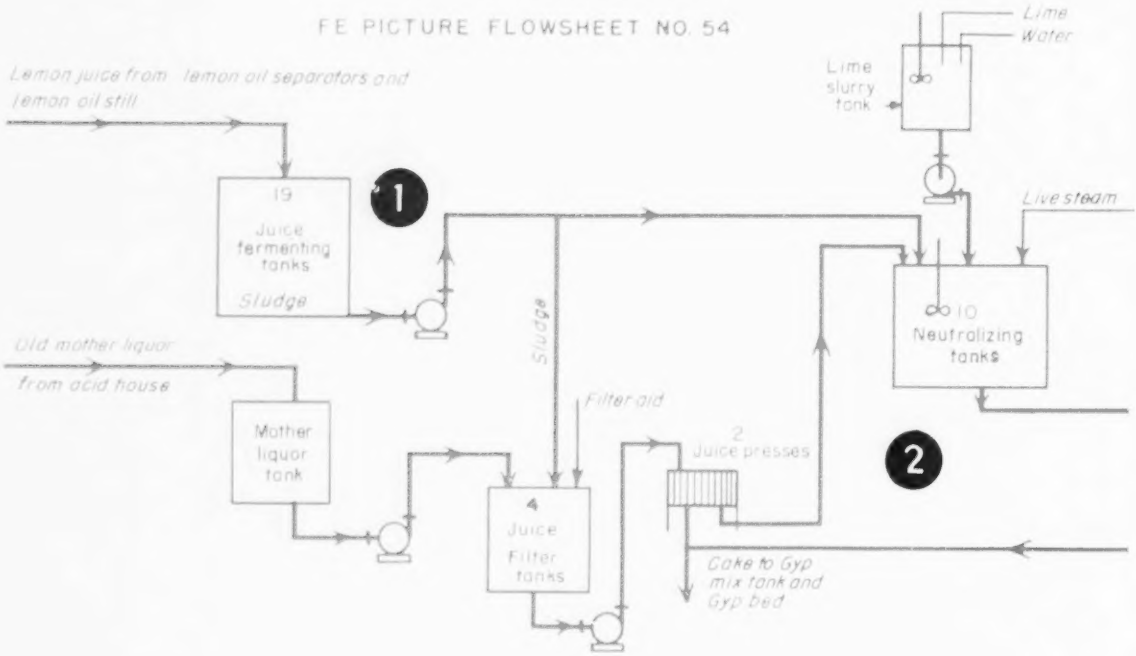
Citric Acid From Lemons

How Commercial Product Is Recovered From Formerly Wasted Culls

DE-OILED JUICE from crushed lemons is pumped to storage tanks—Point (1) in accompanying flowsheet—as the first step in the citric acid process employed by Exchange Lemon Products Co., Corona, Calif.

Aged in these tanks for a week, the juice undergoes the following changes: Natural enzymes in it destroy pectin present; dispersed fine pulp particles become discrete and separate; sugars contained in juice ferment.

Bubbles evolved during fermentation buoy pulp particles to top, forming a cap. A smaller, sediment layer collects in bottom of tank. From an outlet near tank's bottom, aged juice is pumped to neutralizing tanks. Then when pulp portion approaches outlet, juice is diverted to filter tank for treatment and recovery via a press before going to neutralizing tanks.



HOW THIS LINE keystones Elpco's precision lemon processes is sharply defined in this month's special article, "Balance Multi-Product Operation"—on page 58.

Filtered mother liquor is added to juice in neutralizing tanks to fortify acidity. This mixture is then heated, just below boiling point, and agitated for 1 to 2 hr., with steam injected near bottom of tank to promote coagulation of pulp particles.

Then a solution of lime is added to precipitate calcium citrate from the juice. Acidity is determined by titration.

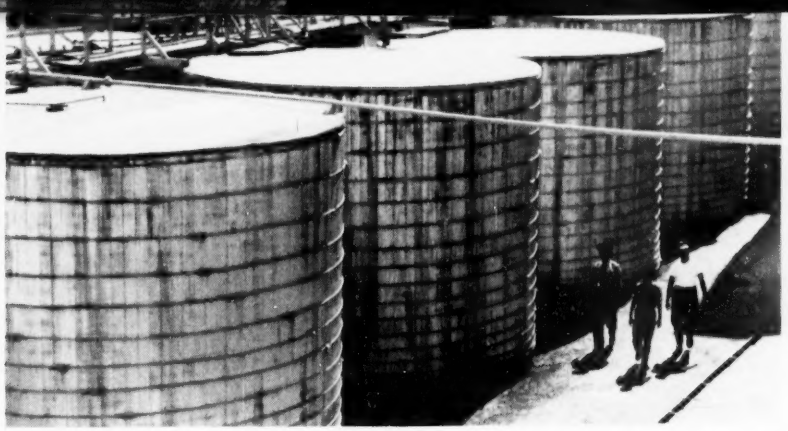
This slurry is pumped to frame filter presses. Filtrate is discarded, cake is washed in the press with hot water, then blown with air for further drying. Citrate cake not needed for immediate production is dried and stored in steel silos—Point (4).

Cake for immediate citric acid processing goes from the press to a decomposing tank containing wash water from an earlier filtration. H_2SO_4 is added slowly to decompose the citrate and free the citric acid. Precipitated $CaSO_4$ is removed via a plate-and-frame press.

Weak citric acid goes to storage tanks, from where it is drawn into a stainless steel vacuum pan. Concentration is carried on at 50-55 deg. C. under 27 in. vacuum. Cooking time is about 4½ hr. Concentrated liquor goes to lead lined tanks. Precipitated gypsum settles out in 24-48 hr.

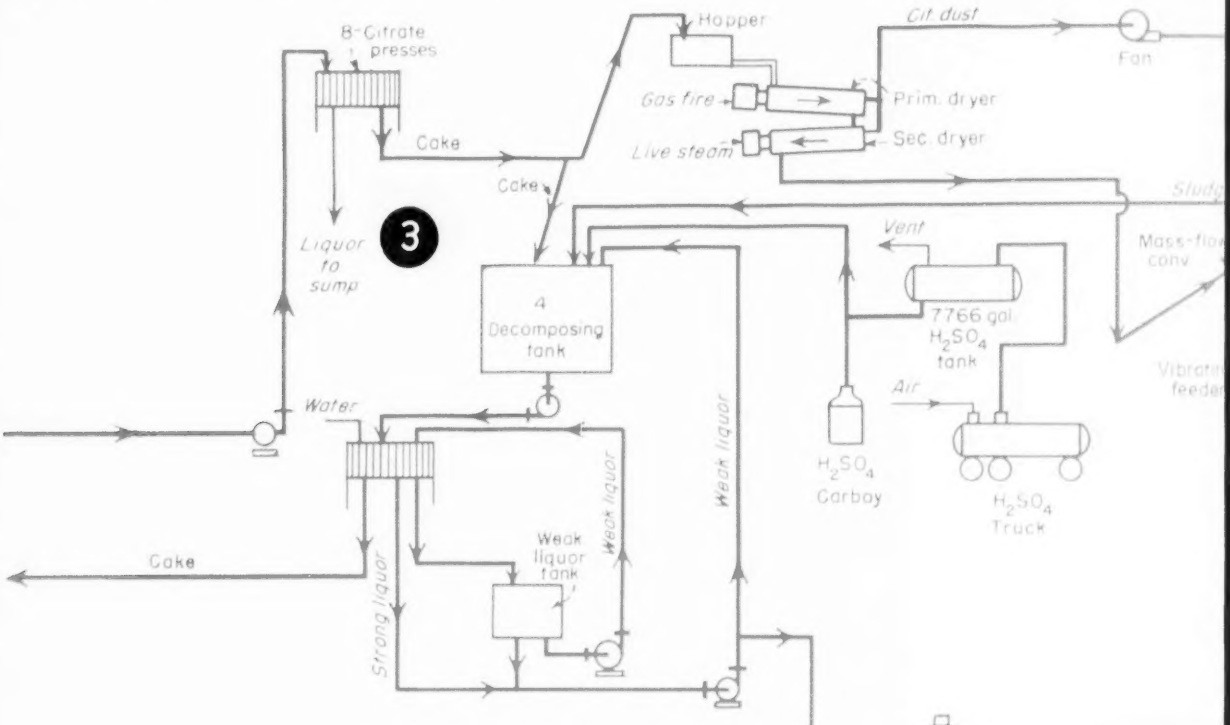
Clear concentrated liquor is drawn off top and goes to a stainless calandria-type vacuum pan equipped with impellers. Liquor is concentrated, then grained in a manner similar to sugar.

Brown grain is grown to a size easily handled in centrifugals. Magma is discharged into a V-shaped mixer having a screw along the bottom for feeding it batch-wise into a stainless Mackintosh basket centrifuge rotating at 1,100 rpm. The "crude" or "brown acid" left is given a short rinse with cool water and centrifuged partially dry. This is called the "A" cook.



1 **IN THESE** large wood tanks, de-oiled juice is retained for a one-week period. Aged juice is then withdrawn from an outlet near bottom.

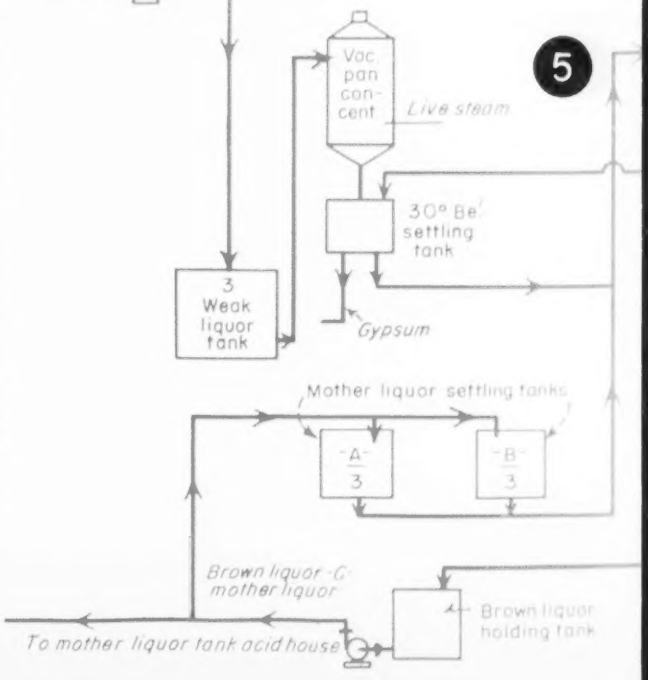
2 **LIME SLURRY** is added in these ne heated by steam injection to form cal



A screw conveyor carries the "A" crystals to a rubber lined tank. Mother liquor spun from the white magma is added and the acid dissolved. Solution is then pumped to treating tank, and adjusted to 30 deg. Bé. Decolorizing carbon and calcium ferrocyanide are added for iron removal. Time period alloted—a few hours. Next, this mixture is heated, and filter aid is added. Then, it is passed to a press to give a clear, colorless citric acid liquor.

The clear liquid goes to a stainless vacuum pan and is concentrated to about 38 deg. Bé. It is then dropped into a mixing tank, filter aid again is added, and once more the liquor is passed through a small plate-and-frame press to give it a sparkling clarity.

The warm liquor is pumped to crystallizers equipped with cool-water jackets. Crystallized citric acid grows and the magma is dropped into a centrifuge. White crystals are collected in cloth-lined barrels and in turn dumped into a bin feeding a rotary dryer. Dried acid is then passed over a separating screen for grading of product to size—coarse, granular, and fine. Underflow from first screen is passed to a second screen.



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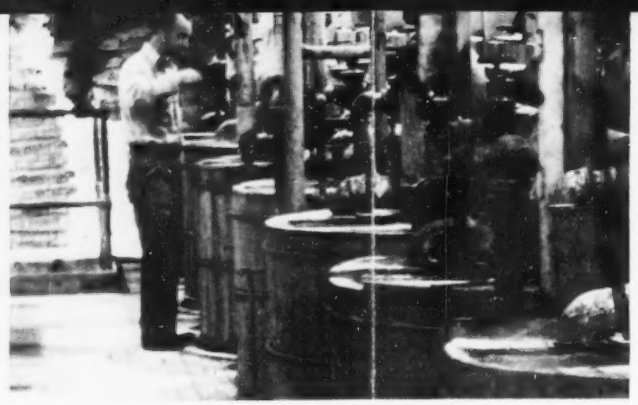
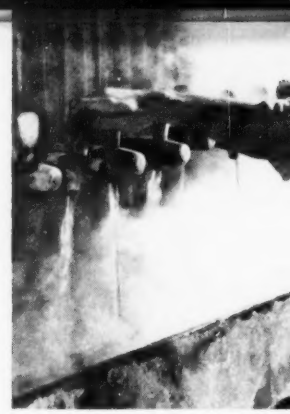
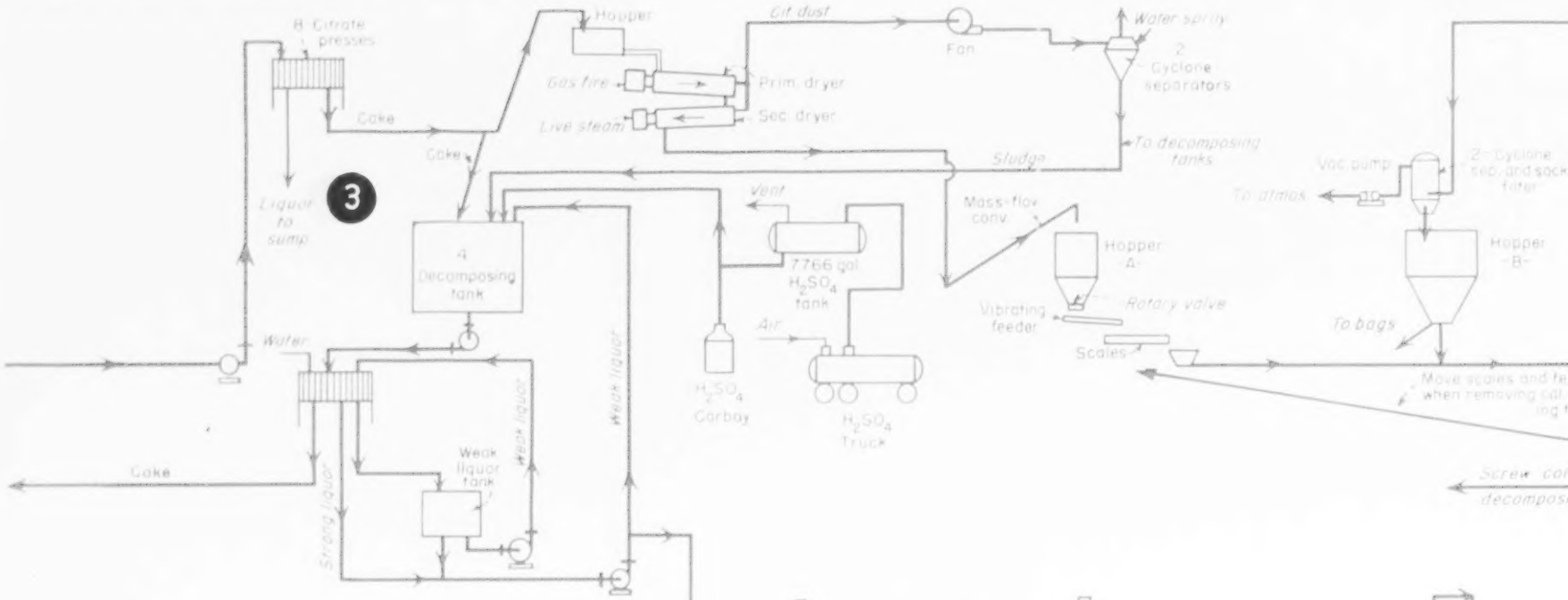


2 **LIME SLURRY** is added in these neutralizing tanks and mixture heated by steam injection to form calcium citrate.



3 **HOT FILTRATE** coming f slurry mixture goes to sewe



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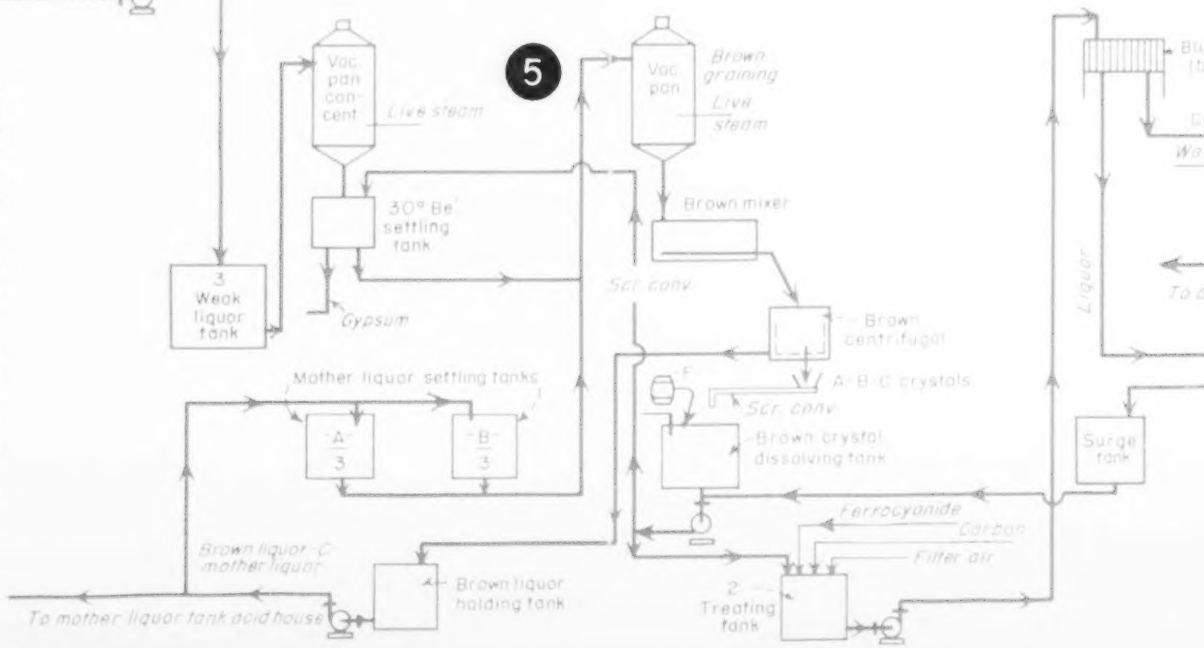
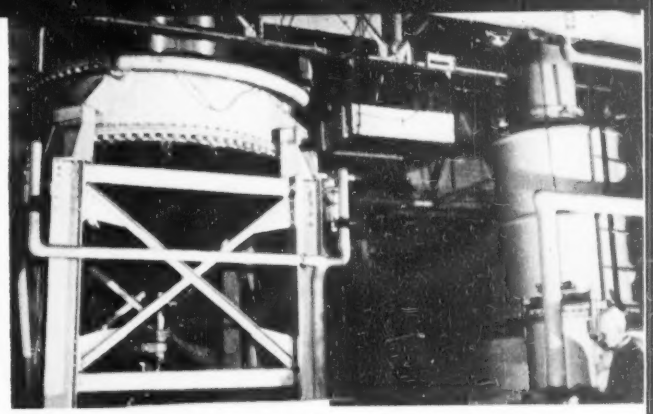
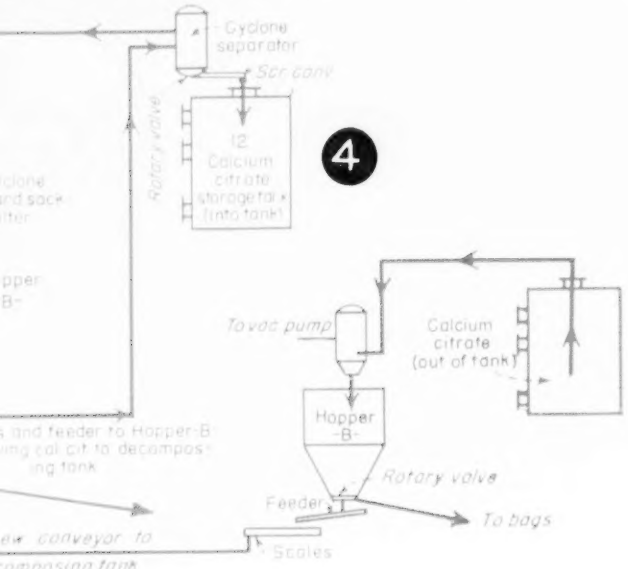


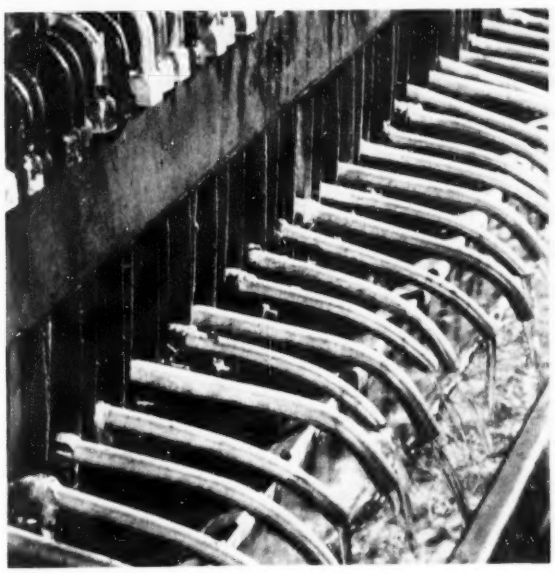
oming from press handling lemon-juice-lime
o sewer; cake to process.

4 BATTERY of steel storage tanks contains dry citrate. Material is moved from tanks via pneumatic lines.



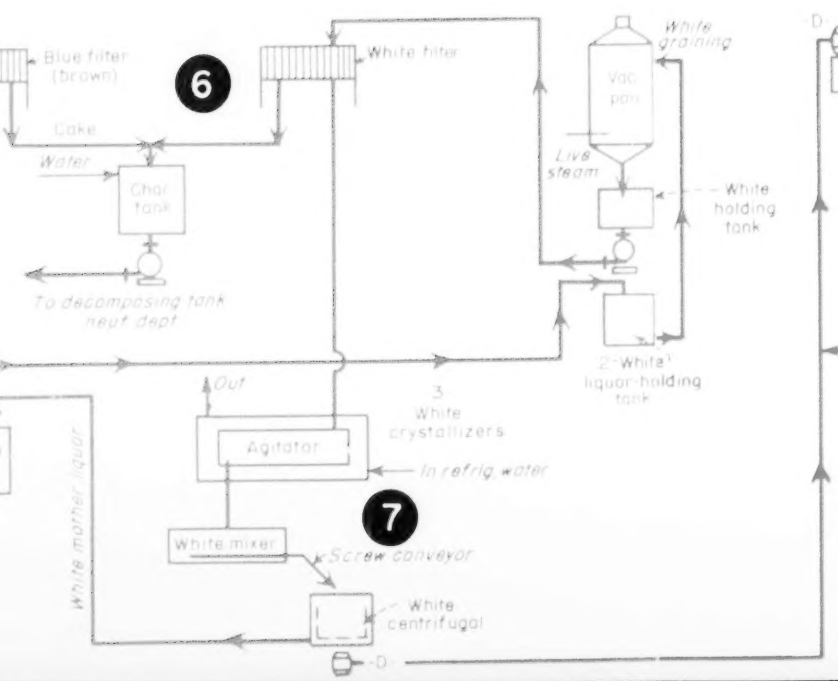
5 VACUUM PANS. Initial grain (brown) is grown in unit at left. Final concentration is made in pan at right.

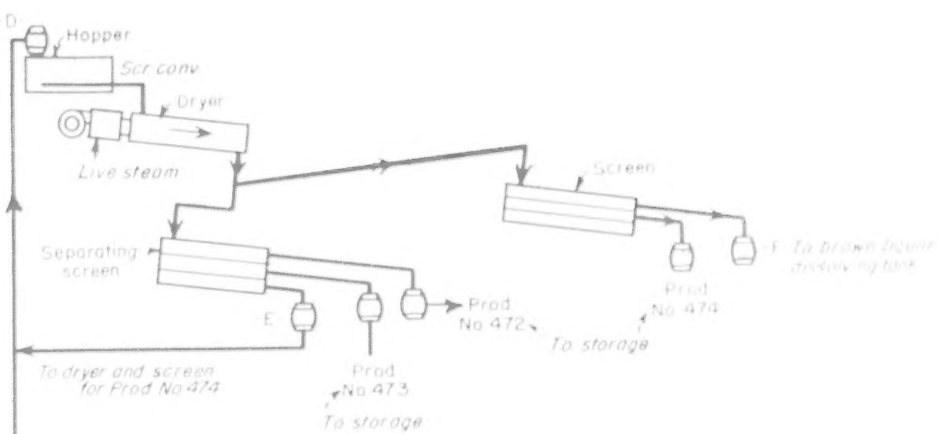




6 SPARKLING, clear warm liquor—citric acid—comes from plate-and-frame press, is pumped to crystallizers.

7 CRYSTALIZED liquor is dropped into centrifugal. Mother liquor is spun from final, white acid-crystals.





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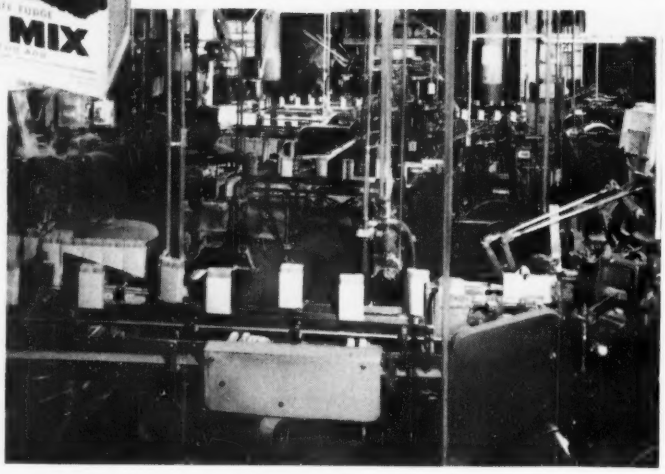
View of packaging room at Pillsbury's Springfield, Illinois plant, showing Pneumatic Double Package Maker equipment in operation.



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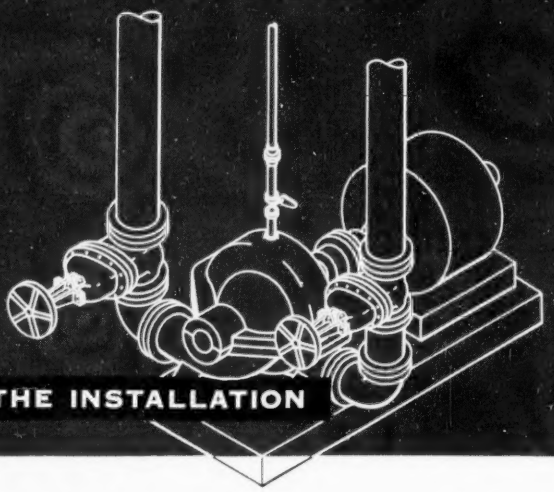

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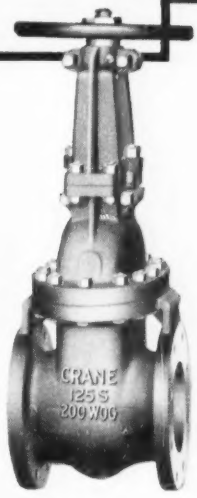

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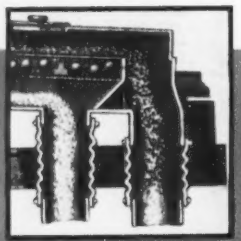

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DEPRECIATION

And Its Crucial Economic Role

The sixth annual McGraw-Hill survey of Business' Plans for New Plants and Equipment, just completed, reveals some remarkable facts about the role of depreciation in our economy. To most people, depreciation is a technical term, used by accountants to discuss a dull subject. But it really is a simple matter: It is the amount of money set aside each year by a company to replace plant and equipment that is wearing out. And here are some facts from this survey* which show how depreciation can make the difference between prosperity and recession in the United States:

1. *In 1953, about half of all the money spent on new manufacturing plants and equipment will come from depreciation reserves.* For the future, manufacturing companies are relying even more heavily on this source of money. In the years 1954-56, they count on using their depreciation funds to pay for almost two-thirds of the new plants and equipment now planned.

2. *The amounts of money made available by depreciation allowances vary greatly from industry to industry.* Some industries, such as those producing steel, chemicals and petroleum products, will have relatively large amounts of cash available from their depreciation reserves. In considerable measure, this is because the government is allowing them to accumulate such reserves at an accelerated rate as an encouragement to build facilities required for national defense. But most of the companies engaged in the production of textiles, processed foods and many kinds of machinery have had little chance to benefit by this provision for accelerated depreciation. Hence, they have much less money available from depreciation reserves.

3. *There is a definite shortage of investment funds in the industries that have relatively low depreciation allowances.* Taken together, the coal mining, textile, food processing, machinery and other metal-fabricating industries plan to spend about $4.7 billion for new plant and equipment this year. But they report that they would spend $1.5 billion *more* per year during the period 1954-56 if sufficient funds were available.

4. *Eighty-five per cent of the manufacturing companies covered by the survey reported that they plan to invest all their depreciation funds* to keep equipment up-to-date and to provide capacity for new products and new markets. These companies could let their depreciation funds pile up as idle cash. But the intention is to spend most of them for capital equipment.

*The sixth annual McGraw-Hill survey of Business' Plans for New Plants and Equipment included companies that provide 25 per cent of all industrial employment and 60 per cent of employment in those industries where capital investment is highest. These companies are mostly the larger companies in their respective industries. A copy of the full report of this survey can be obtained by addressing: Department of Economics, McGraw-Hill Publishing Company, Inc., 330 West 42nd St., New York 36, N. Y.

Hence, there is a direct relationship between the amount of depreciation funds available and the level of capital investment. And it is upon the latter that the level of general prosperity decisively depends. One-third of all industrial workers are engaged in producing or installing such equipment.

This fact that the level of depreciation allowances has a major bearing on the level of capital investment should not surprise anyone. In several foreign countries where these allowances have been increased, investment has boomed. The two nations with the highest ratios of investment to national income are Canada and Norway. Both countries adopted flexible depreciation policies after World War II. In Sweden and The Netherlands also, flexible depreciation allowances have contributed to rapid industrial expansion. Finally, the tremendous investment brought about by our own rapid amortization program shows dramatically the importance of depreciation in stimulating capital expenditures.

Obsolete Tax Laws

In spite of this record, the fact remains that our laws and the business procedures that govern depreciation allowances — in particular the laws and rulings that govern the deduction of depreciation from taxable corporate income — are still based on antique and obsolete accounting concepts which take no account of depreciation's dynamic role in our economy. The internal revenue code still requires most companies to depreciate their equipment over a long period, even though these small annual allowances cannot possibly pay for the investment that is necessary to keep a plant up-to-date under today's rapidly changing technology, with its production of new and improved machinery.

The only allowance made by the government for rapid depreciation is that which is authorized for certain types of plants during the defense emergency. Under this policy most companies are unable to use accelerated depreciation for tax purposes. And as defense projects are completed, the number of new authorizations is dropping. We may lose the chance to utilize fully this powerful tool for sustaining investment because, under our ramshackle emergency tax structure, accelerated depreciation is available only to a minority of firms on a temporary basis.

New Policy Needed

A sensible, up-to-date depreciation policy for tax purposes is long overdue. Either the Treasury must modernize the internal revenue code on its own initiative, or Congress must take the lead by writing into permanent law a flexible depreciation policy applicable to all companies.

Treasury experts now have before them a number of proposals to allow faster depreciation for the average firm. The U.S. Chamber of Commerce has suggested that companies be allowed to deduct from taxable income 25 per cent of the cost of new equipment in the first year, with the remaining cost to be deductible over the life of the facilities. The Machinery and Allied Products Institute has long sponsored a formula that would allow full deduction in two-thirds of the estimated life of the property. In Congress, Chairman Reed of the Joint Committee on Internal Revenue Taxation has stated that we need a more flexible depreciation policy. Senator Frear of Delaware has introduced a bill that would let a business make its own choice on how fast to depreciate its equipment.

It will take time and study to determine which of these various proposals best fits the needs of the economy without sacrificing unduly the revenue needs of the government. If we are to have a new depreciation policy, designed for a long period ahead, it must be carefully worked out. But this much is clear right now: *The development of a flexible depreciation policy on the part of the federal tax authorities is one of the most important steps that can be taken to sustain prosperity. When we talk about depreciation, we are talking about the money that pays for almost two-thirds of the new manufacturing facilities now scheduled for construction. We are talking about the new investment and the new jobs on which our continued prosperity depends.*

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Pickle Fading

Continued from page 61

Pickles were carefully selected for uniform size and green color. After removing from brine they were freshed in flowing water, then tested for salt content by titrating with standard silver nitrate solution using dichloro-fluorescein as indicator. Acidity was determined with 0.166 N NaOH using phenolphthalein.

How They Were Prepared

In making processed dills, desalted pickles were weighed and ingredients added in proportion to weight so that they would all finish with 9 grams acid and 3.8 percent salt. Dill oil emulsion was added to give a final concentration of 1:3000 in brine and pickles.

Jars of pickles were then divided into seven batches of 12 jars each. Brine added to the first batch (No. 1 or control) contained only the standard amount of acid, salt, and spices. This was termed "standard brine". For the other batches various ingredients were added to standard brine as follows: No. 2, 0.1 percent aluminum sulfate; No. 3, soluble turmeric, at the rate of 0.5 oz. per 100 gal.; Nos. 4 and 5, copper as cupric chloride, at rate of 15 and 25 ppm., respectively; No. 6, 0.1 percent alum and 0.5 oz. soluble turmeric; and No. 7, 0.1 percent alum, 0.5 oz. soluble turmeric, 15 ppm. copper.

Thus, liquor and pickles in the seven batches contained all ingredients, separately and in combination, that may be generally found in processed dills.

Brines for different batches were poured on the pickles. Jars were then sealed, pasteurized at 165 deg. F. for 15 min., cooled below 100 deg., and allowed to stand for 48 hr. (until liquor and pickles had equalized), after which they were exposed to various fluorescent lights.

Commercial fresh pasteurized dills and three kinds of sweet pickles were also included in these experiments. Sweet pickles were low-Baumé, testing 14.9 Bé (27 Brix), 12 gr. acid, 2 percent salt; standard, testing 20.35 Bé (37 Brix), 22 gr. acid, 2 percent salt; and double or candied, testing 25.7 Bé (47 Brix), 22 gr. acid, 2 percent salt. Low-Bé pickles were pasteurized at 165 deg. F. for 15 min. All were stored in a room protected from light until ready for use in the experiments.

Pint jars, packed with each type of pickles described, were placed under each of the six fluorescent lamps

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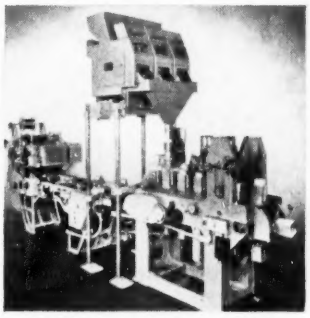

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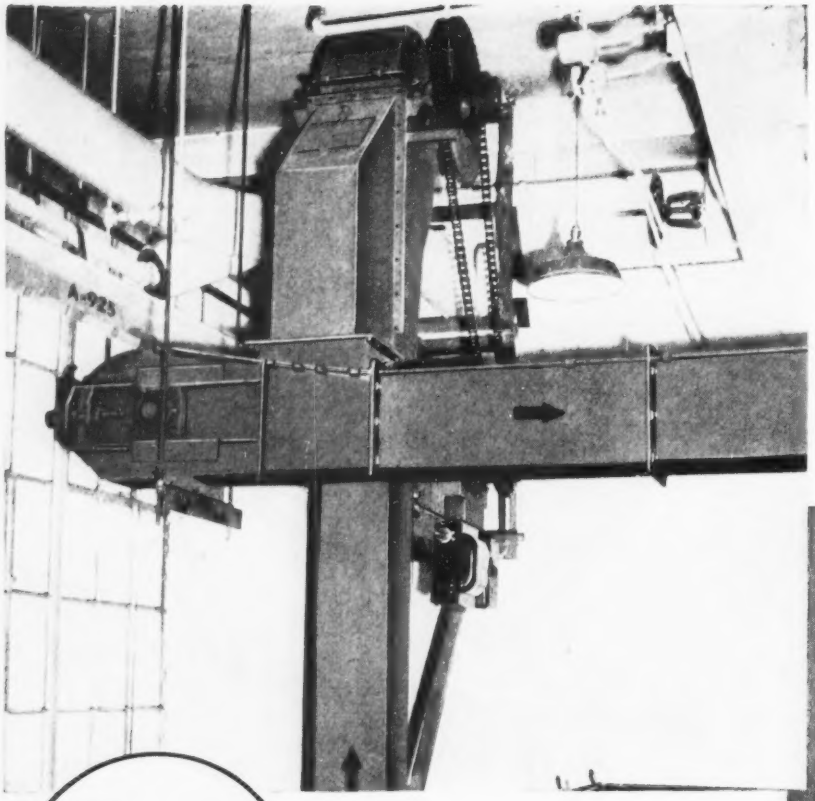

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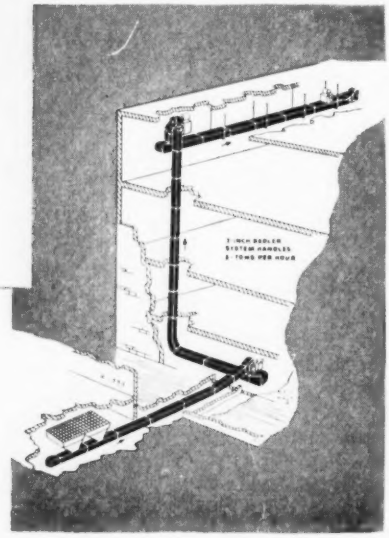

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so that their sides rather than their tops were directly exposed. Exposed sides were then compared to the unexposed bottom sides. As an additional control a set of unexposed pickles of each type was kept in the dark.

Pickles were examined at 6-hr. intervals for 134 hr. Degree of bleaching was expressed as follows —, no noticeable bleaching; 1+ slightly bleached; 2+, partially bleached; 3+, highly bleached; and 4+, completely bleached.

Table I shows results obtained for standard processed dills. It was noted that light from the warm white deluxe lamp had the least effect, whereas that from the standard cool white and daylight lamps had the greatest bleaching effect.

TABLE I—BLEACHING EFFECT of Fluorescent Lamps on Process Dill Pickles Containing 3.8 Percent Salt, 9 Grains Acid, and Standard Spicing

Kind of Fluorescent Light	Intensity Foot-Candles	Bleaching * 0 Hr.	12 Hr.	24 Hr.	36 Hr.	48 Hr.	72 Hr.	96 Hr.	120 Hr.
Soft white	40	—	—	+	+	2+	2+	3+	4+
Standard	46	—	—	+	+	2+	3+	3+	4+
Daylight	50	—	—	—	2+	2+	3+	3+	4+
Warm white deluxe	36	—	—	+	+	2+	2+	3+	4+
Warm white	48	—	—	+	+	+	2+	3+	3+
Standard cool white	54	—	—	+	2+	2+	3+	3+	4+
Control	unexposed	—	—	—	—	—	—	—	—

* —=No noticeable bleaching, +=Slightly bleached, 2+=Partially bleached, 3+=Highly bleached, 4+=Completely bleached.

TABLE II—OXYGEN, Vacuum, and Brine Have Little Influence on Bleaching of Fresh Pasteurized Dill Pickles Exposed to Daylight Fluorescent Lamp

Treatment	Intensity Foot-Candles	Bleaching * 0 Hr.	12 Hr.	24 Hr.	36 Hr.	48 Hr.	72 Hr.	96 Hr.
Pickles completely covered with brine. Brine saturated 3 min. with oxygen	50	—	—	+	2+	2+	3+	4+
Pickles not completely covered with brine. Brine saturated 3 min. with oxygen	50	—	—	+	+	2+	2+	3+
Pickles completely covered with brine, 14 in. vacuum	50	—	—	+	+	2+	3+	3+
Pickles not completely covered with brine, 12 in. vacuum	50	—	—	+	+	2+	2+	3+
Pickles completely covered with brine. Packed in normal manner	50	—	—	+	2+	2+	3+	4+
Pickles not completely covered with brine. Packed in normal manner	50	—	—	+	+	2+	3+	4+
Control	unexposed	—	—	—	—	—	—	—

Curves Tell Story

Graphs were made showing bleaching effect of fluorescent light from the weakest and one of the strongest lamps used on standard processed dill pickles and also on five batches to which various ingredients were added. In Fig. 1 are shown trend lines for the six batches exposed to light from warm white deluxe lamps having an intensity of 36 foot-candles.

Fig. 2 shows effect of fluorescent light on a duplicate set of six batches of processed dills exposed to the daylight lamps having an intensity of 50 foot-candles. Results from the other five lamps are not given since they were, in most cases, intermediate between the results of the two given here.

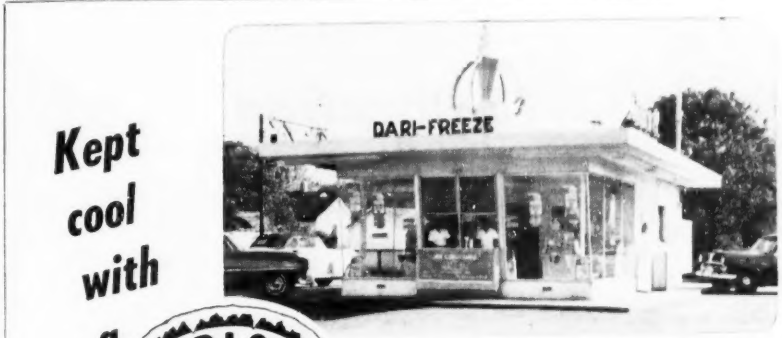
It will be noted in Table I that there is no difference in effect between daylight and standard cool white lamps. This is true for all—except one set of experiments where 25 ppm. copper was added. Here, the daylight lamp produced the same degree of bleaching in 24 hr. as the standard cool white one did in 36 hr.

Effect of Sugar

Next, experiments were conducted to determine effect of fluorescent light on fresh pasteurized dills, processed dills, and sweet pickles containing three different concentrations of sugar and acid. Graphs were constructed for lamps having the least and greatest bleaching effect.

Trend lines in Figs. 3 and 4 show that fresh pasteurized dills were bleached to the greatest extent by all types of lamps. Low Bé sweet pickles were next in order, followed by processed dills, standard sweet, and high Bé sweet pickles. The daylight lamp, Fig. 4, had a greater bleaching effect than the warm white deluxe lamp, Fig. 3. Other lamps were intermediate between these two.

Again the data showed that there was practically no difference in the bleaching effect of the daylight and standard cool white lamps. Processed dills used in these experiments were prepared in Batch No. 7 and had ingredients commonly found in commercial pickles plus 15 ppm. copper.



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the latter doubtless accounting for their resistance to bleaching.

Area Against Glass Stays Green

It was noticed that in all jars where severe bleaching occurred the areas of pickles that were pressed tightly against the inner surface of the glass retained most of their original color. These areas, although tightly pressed against the jar, had trapped only a thin film of brine between jar and pickles. Where brine covered the pickles that were not tightly pressed against the jar, however, bleaching occurred. This interesting phenomenon prompted a number of further experiments.

Pickles of uniform color were selected from a batch of commercially prepared fresh pasteurized dills and packed in six jars. Three were partially filled with brine so that parts of the pickles were not covered when jars were laid on their sides. The other three were completely filled. Then, two completely filled and two partly filled jars were pasteurized at 165 deg. F. for 15 min. Remaining two jars were pasteurized at 165 deg. for 30 min. in order to obtain a higher vacuum. Two low vacuum jars, one completely and one partially filled, were cooled, then opened and oxygen bubbled through the brine for 3 min. All six jars were then exposed to the daylight fluorescent lamp. Observations were made every 12 hr. for 96 hr.

As shown in Table II, bleaching occurred in all jars at the end of 24 hr., irrespective of previous treatments. However, where the pickles were pressed tightly against the jars, only very slight bleaching occurred.

Cause of bleaching appears to be a strictly photochemical process. Oxygen did not assist bleaching in the short time used. It doubtless is a factor influencing color changes over a longer period and under different conditions. Light caused bleaching regardless of constituents in the brine and whether pickles were completely or incompletely covered.

Only where pickles were tightly pressed against the jar was there significant protection against bleaching. It is believed that this protection was due to expulsion of air from pickle cells and to compression of the chloroplasts into a smaller area, thereby intensifying the color.

The above feature story is designated Journal Article No. 1427 of the Michigan Agricultural Experiment Station, and it is published with approval of the Station director.—The Authors.

End (Resume reading on page 62)

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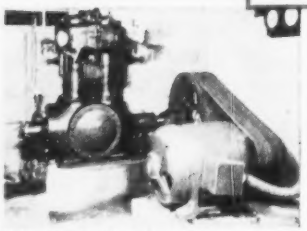
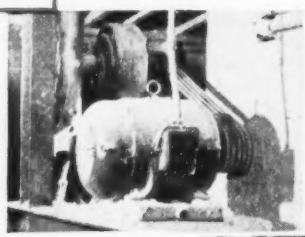
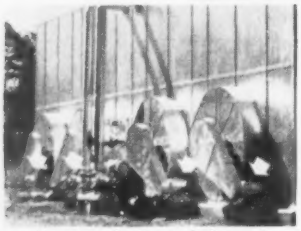
Century C MOTORS

Here is a motor on a refrigeration compressor in a nice clean room. An open type Century general purpose drip proof motor is therefore used.



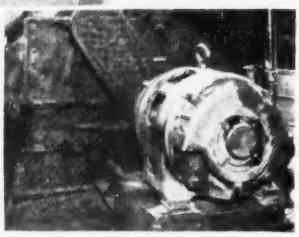


Century 5 horsepower totally enclosed fan cooled motor drives a mixer in a processing plant.



Here are Century splash proof motors driving fans out in the open, without any protection.

When Your Production Hits a Peak...



Century 200 horsepower motor driving a hammer mill used to crush feed.

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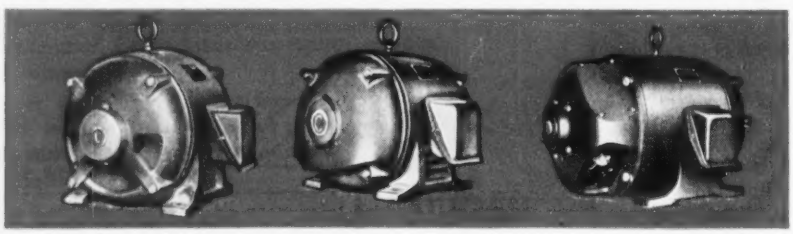
For performance you can depend on specify Century motors on your new equipment, or for replacement. Your nearby Century Sales Office or distributor is always at your service.



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Waste-Salvage Process

—Continued from page 60

by vacuum from storage tanks into a stainless steel vacuum pan having outside heaters. Concentration is at 50-55 deg. C. under a vacuum of about 27 in. (provided by Croll Reynolds Evactors). Liquor (18,000 to 20,000 liters) is pulled in continuously and concentrated until the pan is two-thirds full (about 4,500 liters), with gravity at 30 deg. Bé. Cooking time is about 4½ hr. At this higher concentration, much gypsum which had remained in solution following the calcium citrate and sulphuric acid reaction, has become insoluble and has precipitated out.

Concentrated liquor is pumped to a lead lined tank and allowed to stand 24 to 48 hr., which permits a thorough settling of the freshly precipitated gypsum. It is later removed, made up into a slurry, and pumped back to the decomposing department for filtration and recovery of the acid as weak liquor. Clear concentrated liquor from the top is then drawn by vacuum into a stainless steel, calandria-heated pan having impellers below the calandria and operating at 27 in. vacuum. Temperature range is 45-58 deg. C. during this concentration. Liquor is concentrated to a favorable point, then grained in a manner similar to practice in the sugar industry. This brown grain is grown to a size easily handled in the centrifugals.

Centrifugal Action

Brown magma is discharged into a V-shaped mixer having at the bottom a slowly rotating screw. Screw action keeps the crystals suspended and the magma feeding to the outlet. The approximate 8,000-liter mixer charge is fed batchwise into a stainless steel 30x18 in. Mackintosh basket centrifuge rotating at 1,100 rpm. "Crude" or "brown acid" retained therein after the mother liquor is thrown off is given a short rinse with cool water and centrifuging is then continued to partially dry the acid. This concentrating and graining operation is called the "A" cook, crystals are termed the "A" crude.

The "A" mother liquor from this stage is diluted to about 30 deg. Bé. and pumped to settling tanks, where gummy flocculent materials that have formed (or will form following dilution) settle out. Following two or three days settling time, clear liquor is drawn off the top of the tanks and pumped into the pan for a "B" cook, from which are obtained "B" crystals and "B" mother liquor. This mother liquor is in turn diluted, settled, and the clear liquor used for a "C" cook.

The "C" mother liquor is too impure for further satisfactory handling, hence is returned to the neutralizing department. Here it is partially limed, diluted, filtered, and finally added to incoming juice, as already described. "C" crystals are dissolved in weak liquor prior to the initial concentration (to 30 deg. Bé.) and thus start the cycle again. Sludge from the brown mother liquor settling tanks is pumped to the decomposing department.

A screw conveyor, below the outlet of the centrifuge, conveys the combined "A" and "B" crystallized acid to a rubber-lined tank. Mother liquor, spun from the white magma, is added and the acid dissolved. The solution is now pumped to another rubber-lined treating tank and adjusted to 30 deg. Bé., about 11,000 liters. To it are added decolorizing carbon and calcium ferrocyanide for iron removal.

A few hours' time is allowed for complete decolorizing. Then this mixture (warmed to 60 deg. C. by steam heating) is filtered to give a clear, colorless citric acid liquor.

Press cake is not washed but is

Coming Features in FOOD ENGINEERING

Many more practical articles to aid you in producing highest quality foods at lowest costs are now "on the line" for early issues of FE. Watch for these—

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Electric Eye Grades Fruits and Vegetables for Color
How to Select and Mount Wire Belt Conveyors
Continuous Proportioning Speeds Product Formulation
Brewer Promotes Safety with Tape Recordings
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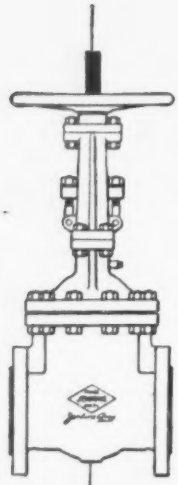

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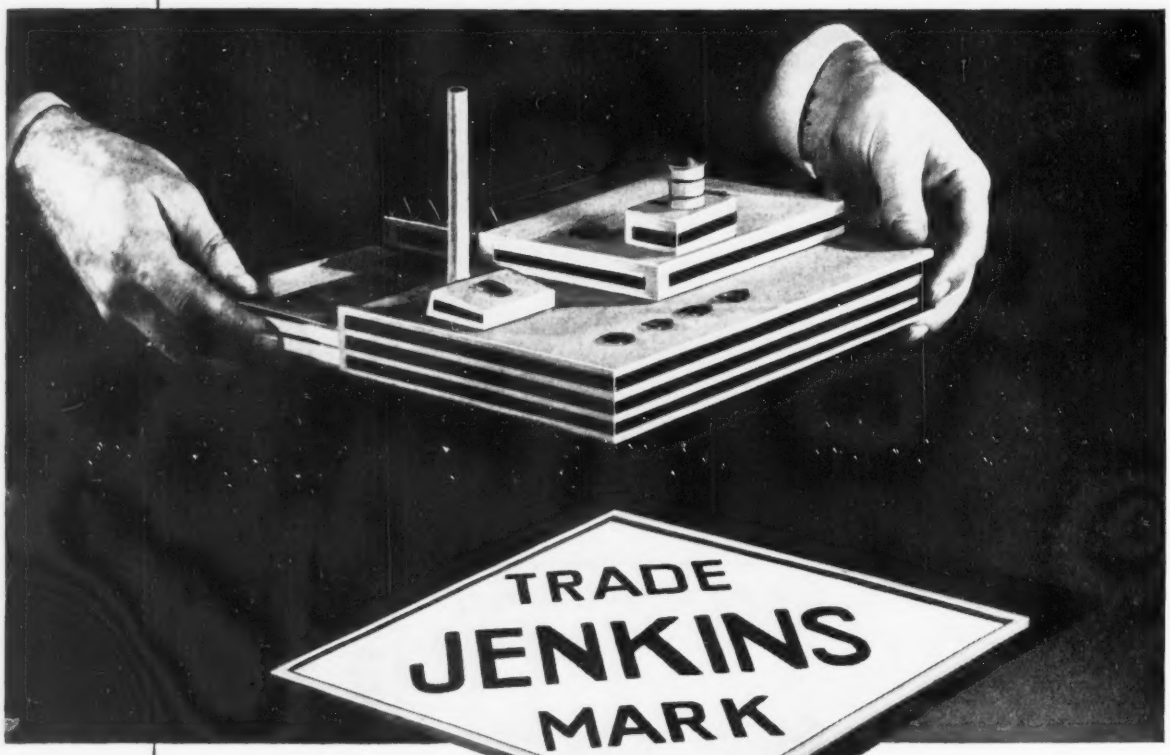


Jenkins Bros

dumped into a char tank and suspended in water. From this tank it is pumped to decomposing tanks for residual acid recovery. The weak liquor is benefited by any residual decolorizing power left in the carbon.

The clear filtered acid liquor is drawn from a rubber lined storage tank into a stainless vacuum pan (having outside heaters) and concentrated to 38 deg. Bé. at a temperature of about 60 deg. C. and a volume of 6,000 liters. It then is dropped into a holding tank, mixed with filter aid, and passed through a small plate-and-frame filter to give it sparkling clarity. Unwashed cake from this press is returned to the decomposing department for acid recovery similar to the preceding filtration.

The warm clear liquor is pumped into horizontal, semi-cylindrical, open-top, jacketed crystallizers. Some of these units are equipped with an open spiral ribbon-type agitator. Others have several rows of rotating shovel-shaped paddles.

At the outset of this unit process, cool water is admitted to the jacket at a slow rate. Gradually the rate is increased and the water temperature decreased so that in 22 to 36 hr. (according to operating convenience) the liquor temperature is brought down to about 62-54 deg. F.

During this time a heavy crop of crystallized citric acid grows in the liquor, producing a heavy magma. This white magma is piped to a mixer that feeds a stainless centrifuge and the mother liquor is spun from the crystals, which are then rinsed with cold water. Mother liquor and water are returned to the dissolving tank for use in dissolving more "A" and "B" crude acid and repeating the cycle.

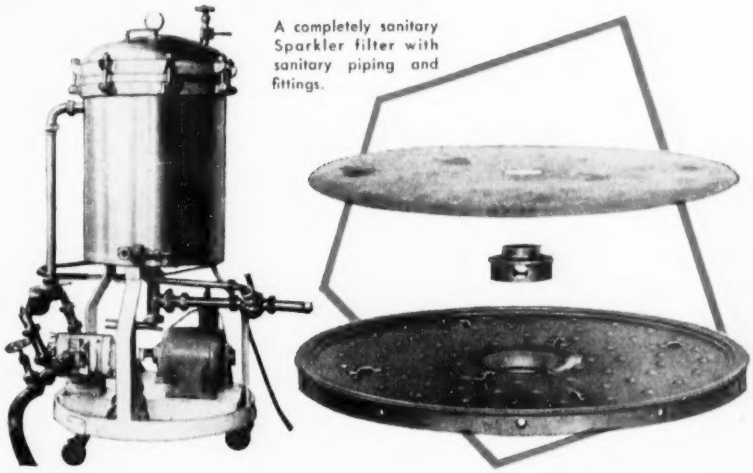
Graded for Size

Crystals are manually "spudded" out of the centrifuge and caught in cloth-lined barrels. The latter are taken to an upper floor and dumped into a bin feeding a rotary dryer, where there is a parallel stream of warm air through the dryer. This air has a temperature of about 80 deg. F. at the discharge end. Dried acid discharges into a bin feeding a Selectro screen, where it is separated into coarse granular (+16 mesh, product No. 474), granular (−16 + 35 mesh, product No. 472), and fine granular (−35 mesh, product No. 473) acid and packed into 100-lb. kegs and 220-lb. barrels for shipment. About 8,000 lb. of crystal acid is obtained from each strike or granulator batch.

The entire process is subjected to close chemical control at each step.

End (Resume reading on page 60)

COMPLETE SANITATION
is a feature of the special sanitary
SPARKLER FILTER
of particular interest to food processors



A completely sanitary Sparkler filter with sanitary piping and fittings.

You can see at a glance why Sparkler filter plates are the most sanitary plates ever designed.

All surfaces, inside and out, are easily accessible for thorough cleaning. The top screen that supports the filter paper, a center separator, and the bottom plate is all there is to it. These parts can be separated without unscrewing bolts or nuts. The tie rods of the complete plate assembly holds the plate parts firmly together without danger of bypassing.

With most other types of filter plates the inner surfaces are inaccessible and cannot be cleaned; contaminating food particles are locked in and the first run of a new batch frequently must be discarded or rerun through the filter to obtain a pure product.

With Sparkler sanitary plates, a pure product is obtained right from the start, and continues pure with fine sharp filtration to the end of the filtering cycle.

Sparkler filter plates can be removed for cleaning in one unit and a fresh thoroughly clean set lowered into the filter tank. This reduces down time to a matter of minutes.

Sparkler filters are available in stainless steel, monel, nickel, bronze, or Hastelloy, steam or brine jacketed. Available in a range of capacities up to 10,000 G.P.H.

They are efficient in filtering all food products such as:—

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Chicken Broth	Milk	Deep Frying Fats
Cider	Molasses	Beet Sugar Syrup
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Flavors	Fruit Juices	Whiskies
Honey	Alcohols	
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Better roads mean a better America

INTERNATIONAL TRUCKS
"Standard of the Highway"

Lifts Packaging Barrier

—Continued from page 47

to eliminate a maintenance headache, and to secure more precision in fill.

Ray of Hope

To Dr. John E. Jacobs, a visiting scientist from G.E.'s X-ray department, the problem appeared immediately soluble. "Why not," he said, "pass an X-ray beam at exact optimum fill-level across the line of moving cans? The fill would normally absorb this beam. But if level is short, the X-ray would pass through the can and to an appropriate detector on the other side of the line. This would permit almost unlimited can speeds, and the absence of mechanical handling would certainly remove the jam hazard."

An amazingly short time was needed to carry this theory into practice. Setting up the beam generator was not a great design problem. Used was a standard Coolidge X-ray tube, encased with transformers in a grounded steel tank mounted on one side of the line.

However, the need for very fine level detection posed a question in the beam pick-up assembly, which was to be mounted on the other side of the line. The answer was provided by using a tiny cadmium sulfide crystal detector providing a sensitive, high-gain pick-up in a very small space.

To insure accurate alignment of beam with detector, the two components were integrated by an enclosed supporting arm so that the whole device suspended in a U over the line with sufficient clearance for cans to pass through unimpeded. In finished form, this inspection head weighs about 200 lb., and it is housed so that it can withstand direct washdown with pressure water spray or steam.

Another important part of the detector set-up was an appropriate control unit for regulating sensitivity of the system. Thus, a rugged, sanitation-proof cabinet was designed, housing the control knobs, electronic amplifier, and relay chassis. This is placed at a convenient location within 50 ft. of the inspection head.

Only two knob adjustments are required at the control station to set up an installation—a voltage regulator for variations of applied peak kilovoltage to the X-ray tube of 50 to 100 Kvp., and a milliameter control of filament current to the tube. Both adjustments "tune in" the sensitivity of the detector, and once made, it is only necessary, for routine operation, to turn the unit on at the beginning of the day and off when line operations cease.

While the detector assembly was found capable of accurately "picking-

is

coil-itis* increasing your temperature problem?

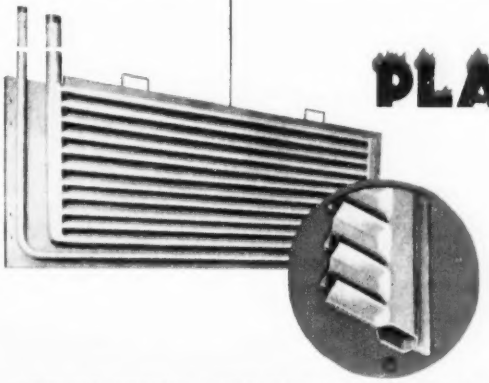
Here is a new treatment for solving your heat transfer problems that is as revolutionary as a new wonder drug. It stops coil-itis* cold . . . It eliminates the many troubles that have plagued industrial heating and cooling practices due to the use of old-fashioned, outmoded pipe coils. This revolutionary new unit, called a Platecoil, heats or cools 50% faster and takes 50% less space in the tank. It simplifies maintenance and saves hours of downtime.

Write for bulletin P81 today!

PLATECOILS SAVE 50% IN HEAT TRANSFER COSTS

PLATECOILS COOL QUENCH OIL TANK FOR ⅓ THE COST

At the K-D Manufacturing Company, Platecoils are proving more efficient, yet cost only 1/3 as much to install. Ask about other case histories.



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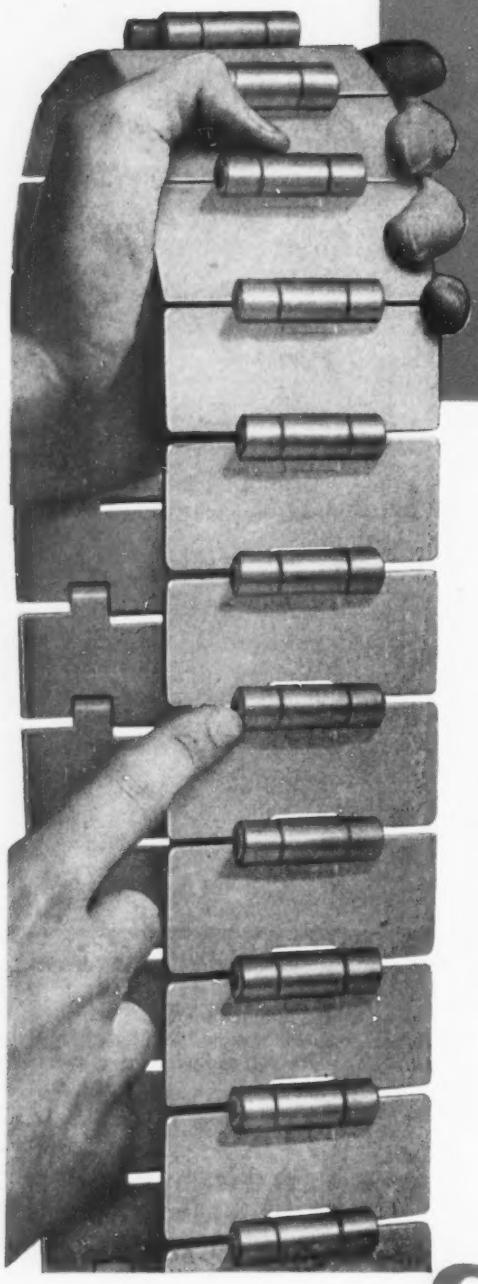
*Coil-itis — Diagnosed as tank heating and cooling problems. **Platecoils** — the prescription for solving pipe coil problems.

PLATECOIL DIVISION, KOLD-HOLD MANUFACTURING CO., LANSING 4, MICHIGAN



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Look at the underside of a strand of Rex® TableTop® Chain, you'll see immediately the big reason for the tremendous success of this chain as a conveyor in bottling and canning plants. More than anything else, it is the amazingly simple TableTop design that makes this chain such a perennial "best seller."

Here's what this simple link and pin construction means to you:

1. **Simplicity makes TableTop easy to clean and keep clean. No corners or "pockets" to catch and accumulate dust, dirt, or food particles.**

2. **Design simplicity makes TableTop particularly easy to install. It fits right into your existing conventional tracks. It's easy to take apart and repair.**

3. **Unique sprocket and simple joint mean wider bearing area . . . longer chain life. There's no load on pins when flexing over sprockets.**

4. **With TableTop there are no rivets or attachments to work loose and wobble. Containers get a smooth, steady trip. Breakage is reduced.**

If you haven't yet tried TableTop in your plant, why not profit from the money-saving experience of so many others? Our Bulletin 53-60 contains the complete TableTop story. Write for it today or call our nearest branch office. Chain Belt Company, 4783 W. Greenfield Ave., Milwaukee 1, Wis.

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up" underfilled containers at rates up to 900 per minute, the next problem was to eject these from the line in equally accurate and jam-proof fashion. This job was tackled directly.

Whenever an underfill is detected, a pair of 51-amp. relay contacts are energized at the control panel. It was desired to use compressed air to "blow" the faulty cans from the line into a bin, hence this electrical signal was utilized to operate a solenoid pilot valve supplying air to an ejector nozzle. The air valve currently used is capable of 2,500 cycles per minute—which limits its ejection rate to a 1,250-per-min. can line speed.

In actual installation, the ejector mechanism is located directly next to the inspection head. The air nozzle simply consists of a $\frac{1}{8}$ in. hole in a pipe-end, supplied by 100 lb. air. This blasts the can off the conveyor and into a metal bin below the line just as it passes the sensing beam.

When the detector mechanism proved itself, the complete monitoring system was installed in all can lines in our Milwaukee brewery and finally on can lines in all Pabst breweries.

Performance to Date

Practically no special problems have accompanied the beam monitors since their installation over two years ago. Maintenance has been negligible—although we have taken the precaution of having three or four of our electricians trained for this purpose by G.E. —and our primary interest has been in improving efficiency of the unit.

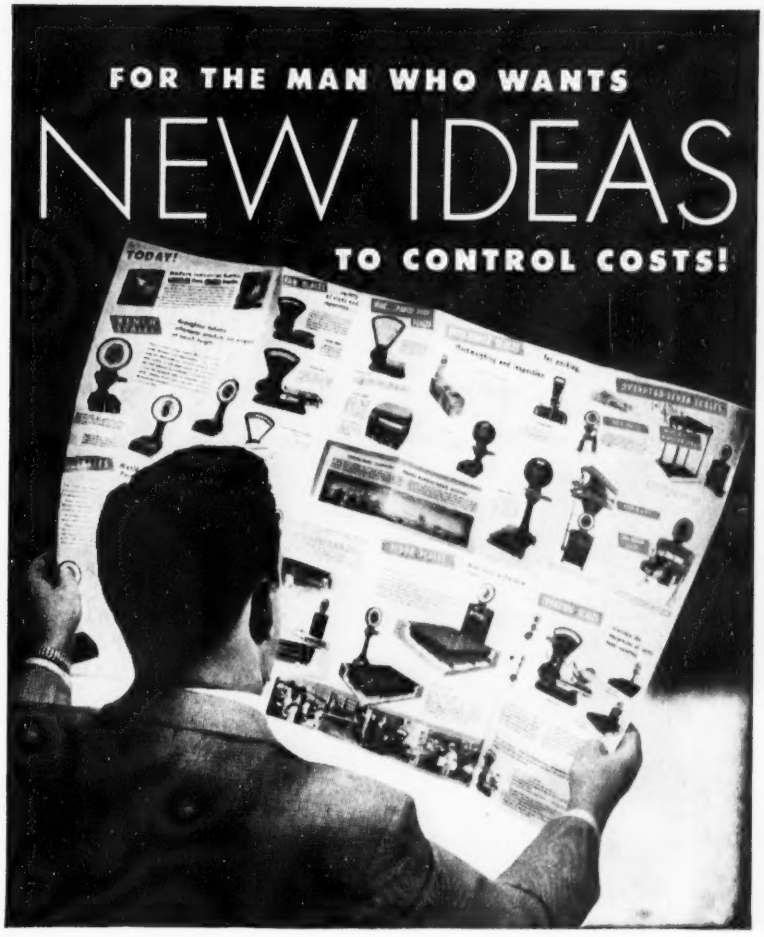
Since, in our experience, this was the first successful high-speed detector, we are now able to increase can line speeds. Also, we have concentrated on raising the sensitivity of the monitoring system so that minute level variations could be detected—and controlled at high production rates.

Any irregularity of line operation—such as a sticky filler valve or improper can sealing—will immediately be indicated by a warning light on the panel, permitting fast correction.

Certain limitations, however, do accompany this near-perfect fill monitoring system. For one thing, it is necessary to have cans upright and on a good sized, level, straight run before they enter the sensing head. Agitation and foaming of the beer naturally means a turbulent surface which will intercept the beam in underfilled cans.

Also, it must be pointed out that variations in the size, shape, and thickness of the container can influence performance. Changes in product density —hence change in container weight— will also go undetected. However, these problems aren't present here.

End (*Resume reading on page 48*)



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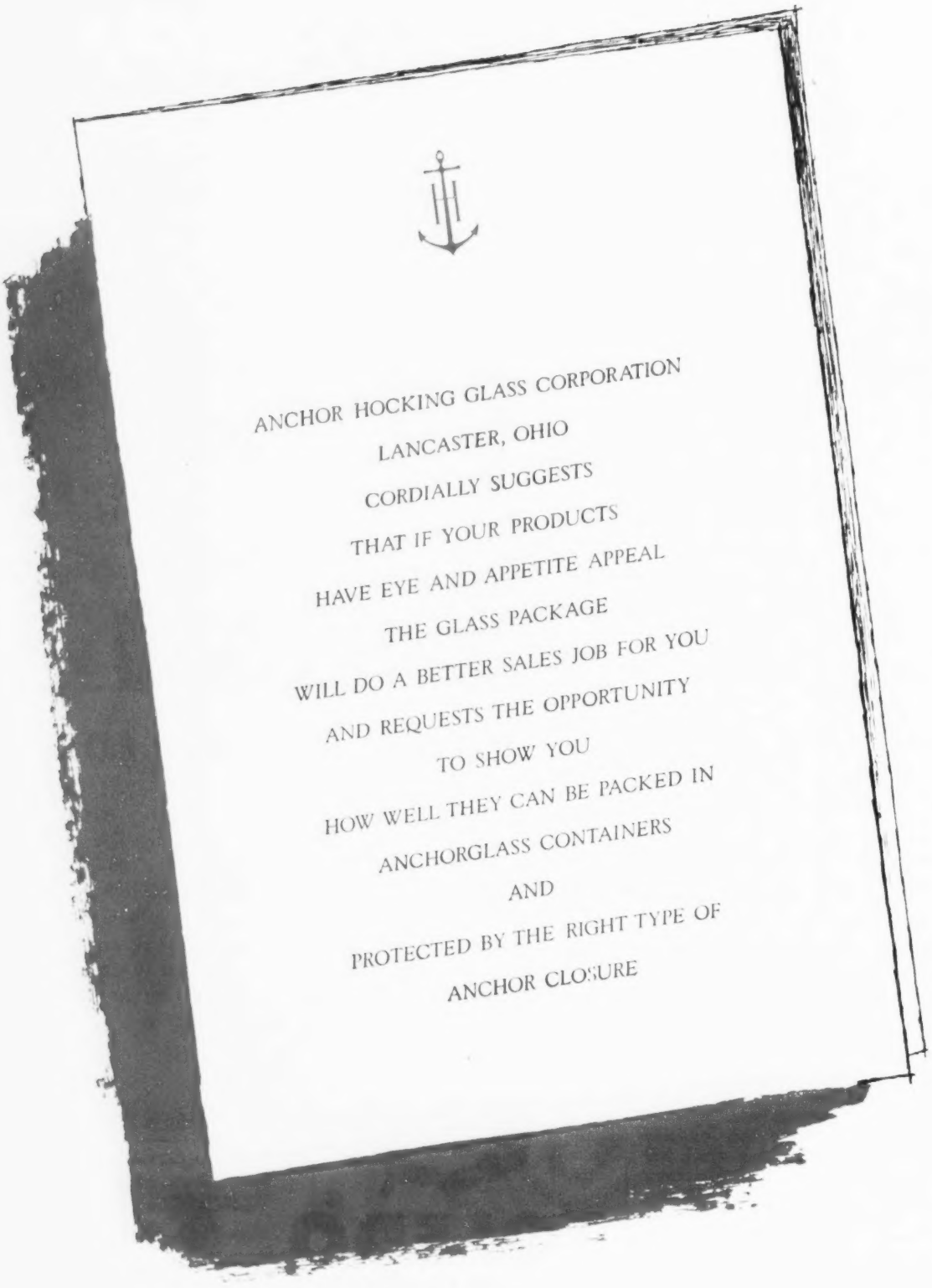

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Shortens Bread Making

—Continued from page 60

are fed as liquid ingredients by standard control pumps.

Feeders and pumps meet rigid sanitary specifications, and they are constructed—insofar as possible—of stainless steel. They are also designed for quick take-apart for cleaning.

Ingredients are continuously fed at predetermined rates controlled from a central panel. Solutions are injected into the pre-mixer along with dry ingredients. Here, thorough mixing takes place, and the dough is then metered into the developer chamber—the third step in the process. Further working of the ingredients making up the dough occurs in the developer.

From the developer, dough passes to the divider and into baking pans—the fourth step. The divider is attached to the developer.

Dough is accurately controlled for weight and it is not touched by hands. At present, the firm is manufacturing machines to cut off dough pieces for a 1-lb. loaf of bread at a rate of 60 a min. Further objective is to produce units that will cut 1¼-lb. and larger pieces.

Dough dividing is mentioned because it is the term accepted by bakers for cutting up dough pieces. Actually, the divider—as bakers know it—does not exist in the Do-Maker. Eliminated, too, are the conventional mixers, rounders, molders, overhead proofers, dough troughs, and fermentation rooms. And there is no longer any need for dusting flour, divider oil, and trough grease.

Ingredients are merely mixed, extruded to size, panned, pan proofed, and baked. From start of mixing to dividing into pans, only about 2 min. elapse!

Although the installation at the firm's Belleville, N. J., plant occupies two stories, it can be a one-story setup. The pilot installation was merely designed to save space and to utilize gravity flow. The entire operation requires about 1,000 sq. ft. of floor space.

Despite rumors to the contrary, there is no employment of ingredients not permitted under the Federal Standards of Identity for Bread. Commercial users will not require reopening of the Standards or any Federal hearings. Wallace & Tiernan is now running commercial-formula doughs through the process. Specialty breads have also been made, and it is stated that any given bread can be reproduced.

End (Resume reading on page 61)

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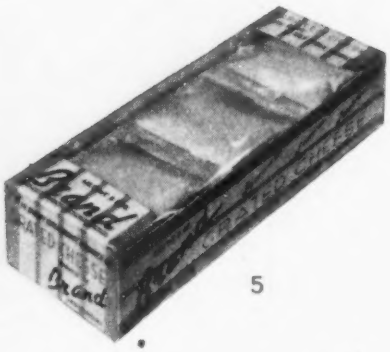
4



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Variety in Portion Control Packages

Within the last year, fractional or portion control packages have been gaining wide acceptance from consumers as well as restaurant and institutional buyers. At the recent National Packaging Exposition in Chicago many new and significantly diverse uses for this type of packaging were displayed. Some examples are shown on this page:

Dry bulk items, such as rice and brown sugar, have long been a problem to housewives since, until recently these items were available only in 1 lb. or larger containers. As most recipes call for a maximum of one cup they found themselves with the remainder of product exposed and apt to stale or deteriorate. Now available is a rice pack containing three fractional units holding one cupful each—the unit of measurement used in most recipes. The three bags are contained in a larger cellophane bag which has cooking instructions and recipes. Brown sugar pack is designed to help prevent sugar from hardening—always a problem in the solid pack carton. Here again, cellophane bag contains three separate cellophane bags holding a cupful each. Thus, in both these packs the housewife can use just one portion, knowing remainder will stay fresh and protected until she finds need for the product again.

To be assured of fresh nut meats at all times, a heat-sealed cellophane, laminated to polyethylene film, makes an ideal container. A number of packs can be stored away with assurance nuts will be on hand, fresh, and crisp, whenever recipe calls for them.

Institutional users and restaurateurs will find the handy "one-serving" pouch for catsup of interest. It is made of cellophane laminated to polyethylene, making a leak-proof envelope.

A package containing 15 one-half ounce, heat-sealed cellophane packets of grated cheese is also available. They are placed in a tray and overwrapped with transparent cellophane.

Another individual portion packet is the disposable pouch for soy sauce, made of polyethylene plastic and lined with a film made of polyethylene resins. This lining gives it a toughness, flexibility, and chemical inert-

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ness, as well as resistance to moisture, oils and greases. A unique feature of this pouch is its controlled-flow spout. Partly slit to facilitate opening, top of the transparent envelope is easily torn off to expose mouth of spout. Held downward, pouch is squeezed lightly and sauce shoots out in a narrow stream. When pressure is lifted, the spout resists flow of liquid even though it is held spout downward.

Lemon concentrate for lemonade is now being packaged by Sunkist Growers Products Dept., Ontario, Calif., distributors for Exchange Lemon Products Co., Corona, Calif., in a 2½-oz. transparent plastic container.

G. Washington Div., American Home Foods, Inc., Morris Plains, N. J., is offering its instant coffee in a strip of three individual (sufficient for one cup each) heat-sealed, aluminum foil packets.

Package suppliers: Photos 1 to 5, E. I. du Pont de Nemours & Co., Wilmington, Del.; Photo 6, product of Bakelite Co., Div., Union Carbide & Carbon Corp., New York City and produced by Purity Pac, Inc., Unionville, Conn.; Photo 7, Reynolds Metal Co., Louisville, Ky. Photo 8, Standard Packaging Corp., Los Angeles.

For Package Data Use Reader Service p. 201

Frozen Seafood Items Spotlighted at Show

Judging by the many items displayed at recent Frozen Food Industries Exposition in New York City, a notable increase in popularity of specialty seafood items is under way.

Some items are shown above. "Tony George's" brand French-fried shrimp and baked stuffed lobster, are but two of a complete line of frozen seafoods being offered by Atlantic Lobster House, Inc., Boston. These uniform sized shrimp, carefully prepared in the famous New England kitchens of Tony George's Lobster House restaurant, are packed in 7-oz. standard waxed chipboard cartons with a colorful label insert overwrapped in cellophane. The baked stuffed lobster are Maine or Canadian chicken type weighing approximately 1-lb. when taken and not less than 8-oz. after processing. Meat is removed from claws and placed in stuffing. Both products are precooked, requiring the usual heat-and-serve method of preparation.

Beaver Brand Frozen Foods, Inc., New York City, introduced a frozen New England clam chowder, under its "Teddy's" label, during Lent. And it was so well received that a special new carton (by Sealright Co., Inc., Fulton, N. Y.) was designed for it and the item is now included among the company's standard frozen seafoods. It is being distributed by The House of Sea Food, Inc., New York City.

Family Frozen Food Products Co., Inc., Brooklyn, has added salmon croquettes to its "Rapoport's" brand seafood list. They are packed four to a standard 8-oz. waxed chipboard box with insert label and overwrapped in cellophane.

A special delicacy item is "Fancy" brand, quick-frozen rock lobster tails, processed and packaged by CIA, Pequera de Cuba, "Conga" S.A., Havana, Cuba. Each carton contains five to six small, tender lobster tails. Cooking instructions are given on package.

For Package Data Use Reader Service p. 201

Rainbow-Colored Popcorn

Now—popcorn in variegated colors! Color-Corn Corp., Chicago, is marketing a 10-oz. bag of colored kernels made from hybrid popcorn and pure, certified food coloring. When popped, the result is a bowl of white popcorn, splashed with many brilliant colors.

Product is packaged in a heat-sealed, transparent film bag (Milprint Inc., Milwaukee) allowing the brightly colored corn to show through.

For Package Data Use Reader Service, p. 201

"Schweppes" Bottled Here

Famed in England since 1794, the well-known Schweppes Quinine water is now being bottled in this country.

Though formerly bottled and distributed solely from England, a franchise arrangement has now been concluded whereby Metropolitan Bottling Co., Inc., a wholly-owned subsidiary of Pepsi-Cola Co., New York City, will bottle and distribute Schweppes products in North and South America. A similar agreement by which Schweppes will do the same for Pepsi-Cola in many localities in England, is under negotiation.

Manufactured from ingredients imported in stainless steel containers from England, quinine water will be marketed in 6- and 10-oz. sizes. It will be the same in every respect as the product bottled in England. However,

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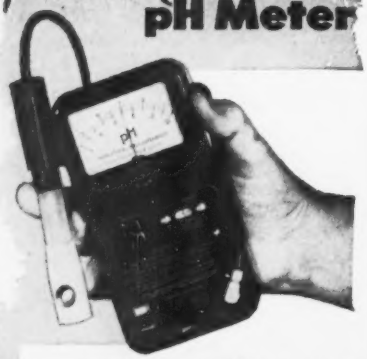
new...
pocket size
pH Meter



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it will be possible to offer product at new low prices without sacrificing the quality, as it will eliminate the heavy shipping cost of transporting bottles across the Atlantic. It is expected that a 90 percent saving in shipping charges will be effected.

Bottles used will be of the distinctive Schweppes style and will bear traditional yellow and black labels used throughout the world. To stimulate sales, delivery trucks will closely resemble the ones used in England, and their drivers will wear the same kind of uniform as worn by their English counterparts.

More Dietetic Offerings

With the growing interest in dietetic and low-calorie foods, processors in all food fields are giving this subject much thought and research.

With the introduction of a new line of low-sodium, low-calorie canned soups, Andersen's Foods, Inc., Santa Barbara, Calif., is one of the first to introduce a dietetic soup to the national market.

This new dietetic line includes three flavors—split pea, potato, and tomato vegetable. A salt substitute, which is claimed does not impair flavor, is used in seasoning the soups.

And, a "sugar-free" gelatin, is being offered by Enzo Jel Co., Sheboygan, Wis., under tradename of "Jelex." Product comes in six flavors: strawberry, cherry, raspberry, orange, lemon, and lime.

Sugar-free, a sweetening agent, "Sucaryl" (Abbott Laboratories), is used as the sweetening agent.

Cookies With Child Appeal

Two cookie items, Bugs Bunny and Porky Pig, with cookies as well as package, designed to appeal to children, have been added to present line of Burry Biscuit Co., Elizabeth, N. J.

The Bugs Bunny cookies are a sandwich creme-type cookie with imprint of Bugs Bunny on one side and Porky Pig on the other. Each 10-oz. carton contains two waxed cellophane bags, each containing chocolate flavored or vanilla flavored cookies. The carton itself is brightly illustrated with reproductions of cookies and caricature of Bugs Bunny.

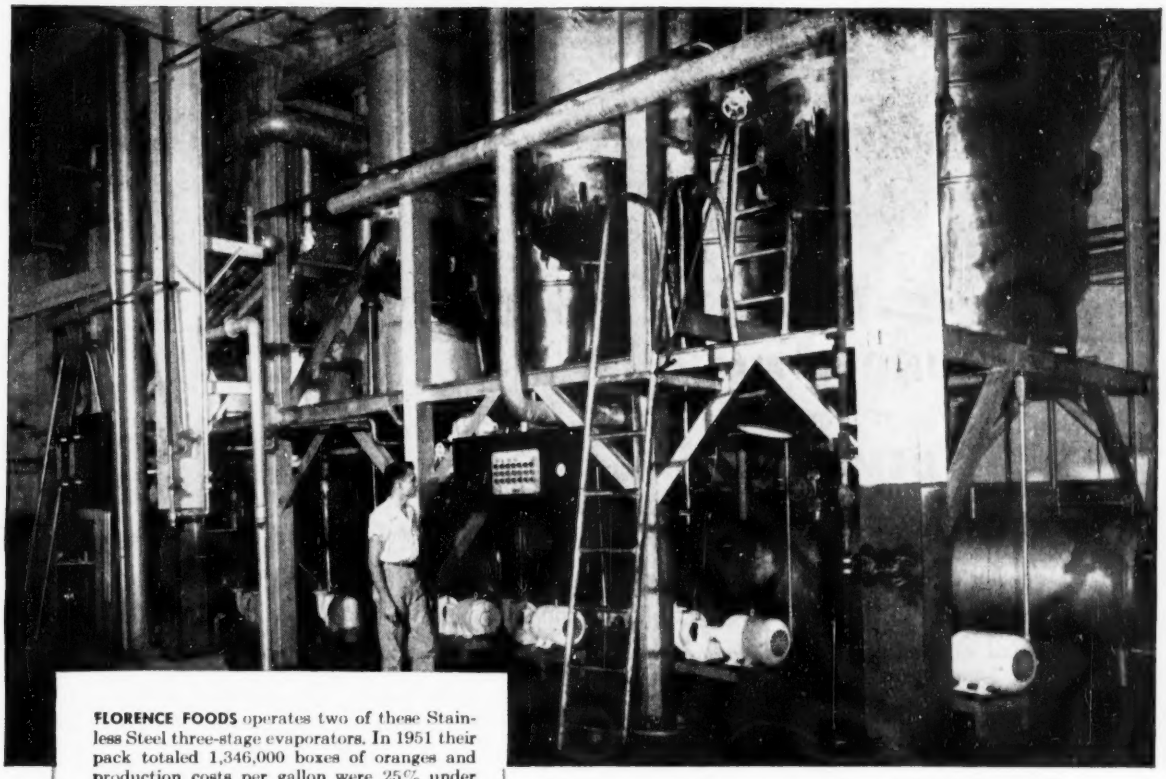
The Porky Pig 11-oz. carton contains 48 cookies with 12 different cartoon characters. Cookies are wrapped in 4 heat-sealed cellophane bags for added protection and to allow one pack at a time to be opened thus keeping balance of cookies fresh. This carton is also illustrated with reproductions of cookies, caricatures of Porky Pig, and other comic figures.

All characters are copyrighted figures of Warner Bros. Cartoons, Inc.

Frozen Corn Fritters

Well-known for its complete line of frozen blintzes and pancakes, Milady Food Products, Inc., Brooklyn, N. Y., is now offering frozen precooked corn fritters.

Four fritters are packaged in a conventional 6-oz. waxed-chipboard carton and overwrapped with colorfully designed cellophane.



FLORENCE FOODS operates two of these Stainless Steel three-stage evaporators. In 1951 their pack totaled 1,346,000 boxes of oranges and production costs per gallon were 25% under the Florida average. Evaporators were manufactured by Mojonnier Brothers, Chicago, Ill.

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A good example is the frozen citrus concentrate field. Florence Foods, Florence Villa, Fla. gives credit for its high production volume and low production costs to two Stainless Steel three-stage evaporators, interconnected so they can be operated in series for flexibility in capacity.

Depending upon the supply of fresh fruit, the evaporators are used individually or in series as a six-stage unit, with two stages for high Brix juice and four stages for low Brix juice.

Production is continuous during the season, 24 hours a day, with a six hour shutdown every seventh day for general cleanup. The smooth, dense, durable surface of Stainless Steel is made for quick cleaning. It is unaffected by fruit acids, and, in turn, has no contaminating effect on the product.

If you're looking for equipment that will reduce down time and make processing operations as continuous as possible, investigate Stainless Steel. And for finest performance, insist on U·S·S Stainless Steel for your equipment.

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UNITED STATES STEEL

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UNITED NATIONS
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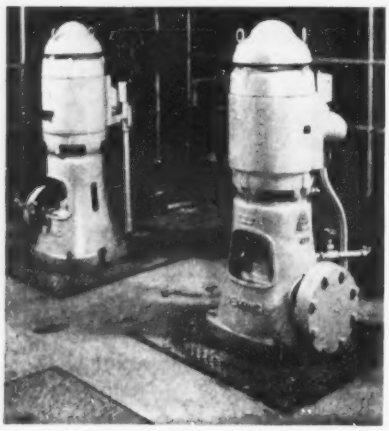
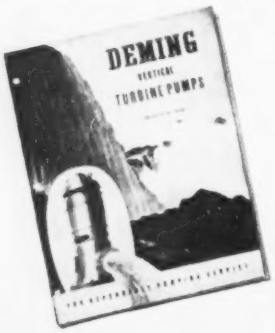
Here's another example of the versatility of Deming Vertical Turbine Pumps. Designed originally for deep well pumping, the efficiency and adaptability of these pumps has extended their application to a diversity of liquid handling services.



The two Deming Turbine Pumps illustrated are part of the air conditioning system at the United Nations Building in New York City. Salt river water from the East River flows through conduits to the third basement level and is pumped through rotating drum type screens to free it of foreign matter before use in the air conditioning systems. The Deming Pumps wash the rotating screens to prevent them from clogging.

The installation was made by Kerby Saunders, Inc. Each unit pumps 200 gallons per minute against a 35 foot head. Pumps are powered by 5 H.P. motors.

Deming Vertical Turbine Pumps are available in a full range of capacities up to 3500 G.P.H.



write for bulletin 4700

This illustrated bulletin gives essential facts about Deming Vertical Turbine Pumps.

THE DEMING COMPANY
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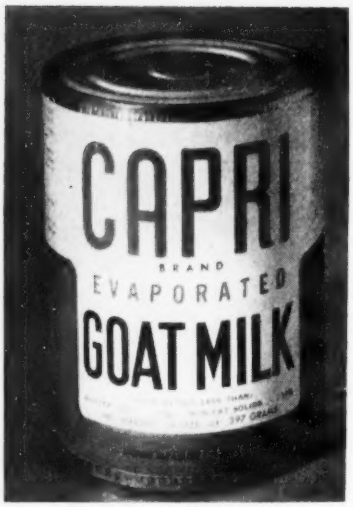
DEMING PUMPS



Canned Goat Milk

Because of its easy assimilative properties, goat milk is often recommended by physicians for infant feeding and for adults allergic to other milks.

Procuring it, however, is not always a simple matter. But now it can be obtained in cans, in evaporated form, stored on the shelf and used as needed.

Homogenized, unsweetened, and sterilized, it is produced by California Goat Dairymen's Assn., for Newcombe Mead Co., Inc., Los Angeles. It is available in 12½-oz. cans under the "Capri" label.

Handy Pack for Wild Rice

Cresca Co., Inc., New York City, is packaging its "Cresca" brand wild rice in a compact, eye-appealing, transparent plastic container.

Each container holds 5-oz., which is considered sufficient for 6 servings. Directions for preparation are given on the one side of pack. Attractively designed, front panel presents a hand-painted effect, showing wild geese flying into a white circle which carries brand name and identification.

For more information, use coupon on page 201.

IS YOUR PACKAGE SELLING YOUR PRODUCT IN TRANSIT?

An example of how **STONE CONTAINER CORPORATION** and **ABBOTT DAIRIES** of Philadelphia, working together, brought about a Multi-Tone* carton in silver metallic board with a special interior and felt lining to cut down damaging condensation and hold ice cream in dry ice. A carton which could be used over and over again—

Figures above are from pictorial Pilot Survey recently conducted in Chicago.

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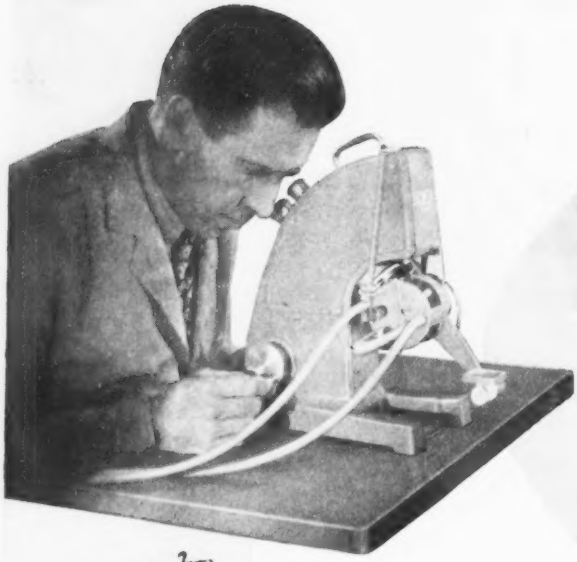

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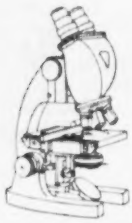

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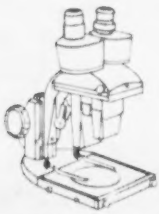

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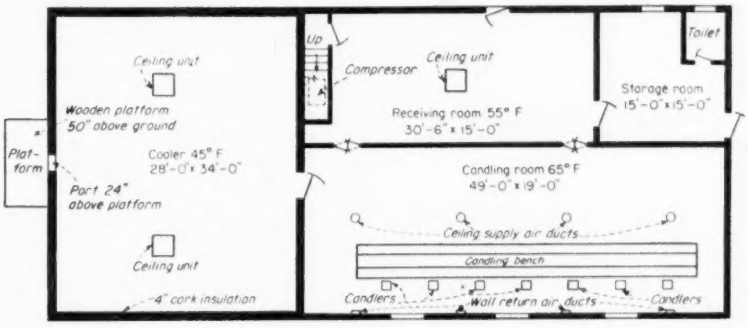

Completely Air-Conditioned Egg Assembly Plant Has Capacity to Handle 50,000 Cases Annually

Temperature control of eggs from the time they are received until loaded out is the outstanding feature of a recently designed egg assembly plant.

This is accomplished through two separate systems, one for refrigeration and one for complete air-conditioning. Refrigeration equipment consists of a 5-hp. condensing unit and 3 ceiling type unit coolers (see drawing above). Air-conditioning system consists of a horizontal oil burner, and a 2-hp. unit installed in the attic above candling room to minimize duct work.

In receiving and candling rooms it is possible to lower temperatures overnight, eliminating movement of eggs into cooler and preventing them from sweating during candling the next day.

Following candling and packing, eggs are transferred to cooler and accumulated for shipment. In an emergency, cooler could hold 1,800 cases, but it is doubtful there would ever be need for so much storage.

Size and location of loading-out port in end wall of cooler are important. Port should be high enough to permit use of conveyors arranged in a continuous line to minimize handling. Wooden platform will expedite truck loading. This arrangement allows one man in cooler to supply eggs to 2 men loading a truck.

Plant should be able to handle 1,000 cases a week. Inexperienced candlers or dirty, mixed or small lots of eggs will, of course, reduce this.

Digest from "Modern Egg Assembly Plant," by N. G. Paulhus and F. P. Delle Donne, *Marketing Activities*, 8-11, Feb. 1953.

Storage With Carbon Dioxide Extends Life of Franks

Shelf life of frankfurters can be considerably extended when they are stored in an atmosphere containing appreciable quantities of CO_2. This is due not so much to control of total microbial population as to restriction of types which most rapidly cause deterioration.

At 50 percent CO_2, molds, micrococci and yeasts are completely controlled. Growth of lactobacilli, on the other hand, is not influenced by it. Greening did not occur with samples stored under 75-96 percent CO_2, although it did appear occasionally with frankfurters stored at lower gas levels.

From this it appears that CO_2 is more effective against greening lactic acid bacteria than against some other types.

Digest from "Post-Mortem Changes in Stored Meats. V. Effect of Carbon Dioxide on Microbial Growth on Stored Frankfurters and Characteristics of Some Microorganisms Isolated From Them," by W. S. Ogilvy and J. C. Ayers, *Food Research*, 121-30, March-April 1953.

Dry Milk Supplement Makes Better Pigs

Yeast, or yeast and cystine, does not replace dry milk in the diet of hogs fed barley as the chief feedstuff.

Three groups of six pigs were each fed barley plus dry milk solids, barley plus feed yeast (from aerated molasses medium), and barley plus yeast with 2 percent cystine supplement based on the ration. Experimental feeding lasted 124 days, during which the milk-fed pigs attained a weight of 248 lb., the yeast-fed 196 lb., and the yeast-plus-cystine-fed 237 lb., for weight gains of 39.0, 33.8, and 36.5 percent of feed, respectively.

On slaughtering, yeast fed animals showed the greatest loss, 18.8 percent, milk-fed the least, 16.9 percent. Quality and weight of the wholesale cuts were also best for milk-fed animals except for ham weights which were best for the yeast-fed animals. Hemoglobin was highest in blood of animals receiving milk in their feed, poorest for those receiving yeast.

Cystine improved hemoglobin in those receiving it, but did not bring them up to milk-fed animals. Yeast protein was improved in biological value (10.4 percent) by addition of cystine, but this addition had no appreciable influence on slaughtering quality.

Digest from "Feeding Experiments on Hogs With Yeast and Cystine Supplements," by G. Rothes, H. Havermann, R. Heymer, H. Fink, and Ilse Schell, *Brauwissenschaft*, 3, 41-47, 1953.

BAKING

Behavior of Doughs

Dough exhibits elastic behavior when stretched, but when extended beyond elastic limit, flows like a very

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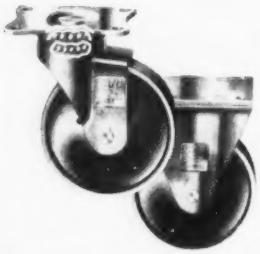

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viscous fluid. The flow is actually plastic, however, and not viscous, since a certain minimum stress must be applied before it occurs.

For best loaf of bread, ratio of viscosity coefficient to elasticity modulus should be high. When stresses on doughs are very high viscosity is reduced, but if dough is stretched repeatedly, it becomes very stiff or "work-hardens" just as metals do. Oven-spring can be significantly affected by these changes.

Shape of gluten particles has much to do with properties of dough, and present evidence indicates that in solution these particles are ellipsoidal with a ratio of length to width of 20 or more.

Salt linkages and hydrogen bonds occur in gluten particles, and disulfide interchain bonds seem to be especially important. Reduction of these to sulfhydryl groups destroys gluten structure and softens doughs.

Dough improvers, conversely, oxidize sulfhydryl groups, thereby toughening and strengthening the dough. This behavior closely parallels behavior of wool or hair keratins and suggests that gluten is a fibrous protein.

Digest from "Dough As an Industrial Colloid," by J. Cunningham, *Chemistry & Industry*, 8, 163-66, Feb. 21, 1953.

FATS & OILS

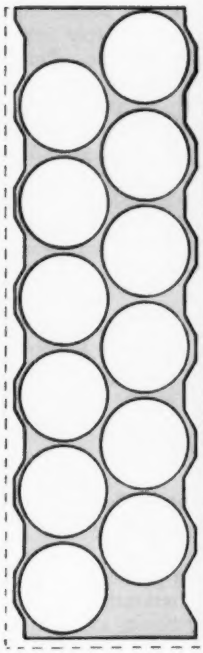
Chlorinated Solvents For Soybean Oil

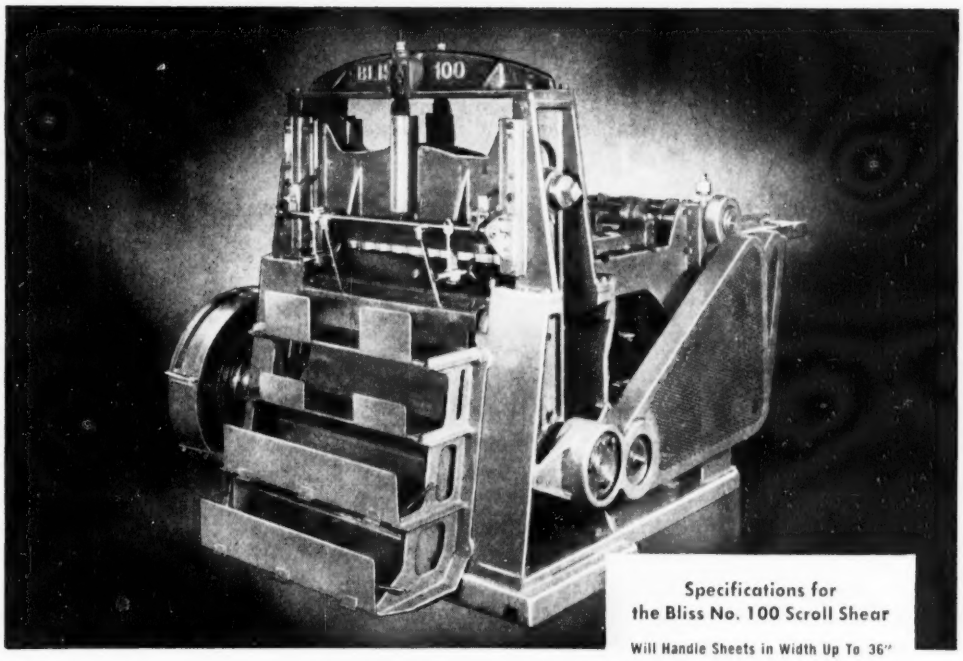
In addition to trichloroethylene and methylene chloride, four new chlorinated solvents for soybeans have been investigated. They are methyl chloroform, ethylene dichloride, propylene dichloride, and 1,2,3-trichloropropane.

Miscellas of different concentrations for each solvent were made by weighing the constituents on an analytical balance. Specific gravity for each concentration was determined by means of a Westphal balance.

Comparative extraction-rate data were determined by passing solvent down through batches of flaked soybeans in a glass tube. Miscellas flowing from the tubes were collected over definite time intervals, and amount of oil in each increment was calculated from the sp. gr.

Extraction-rate curves are typical for solvent extraction of soybean oil. It is difficult to distinguish between the curves during the first 5 min., but original data show ethylene dichloride to be a slightly better solvent than propylene dichloride during the first 10 min. This trend is reversed after 15 min.





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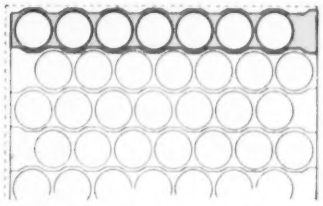

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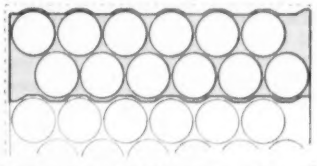

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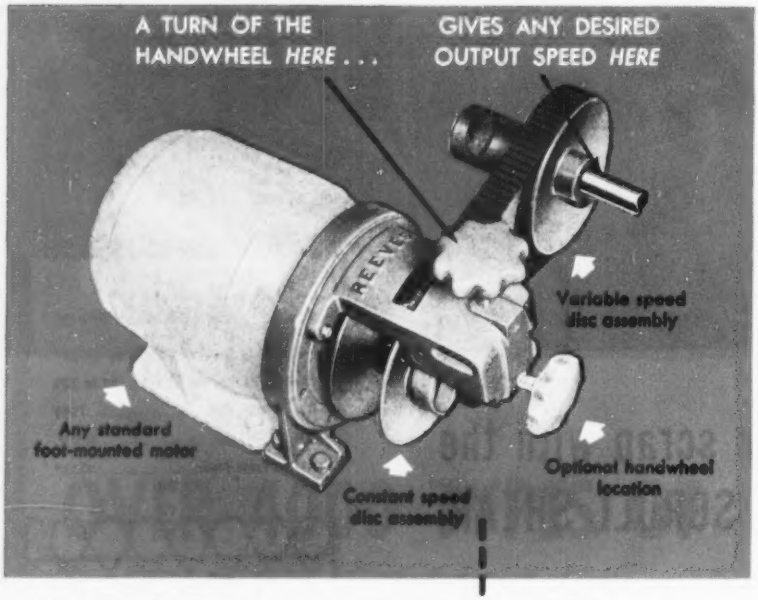
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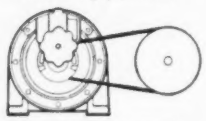
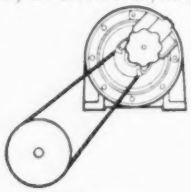
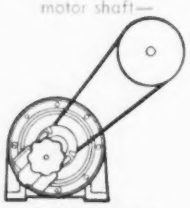
Some of the mounting positions



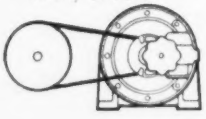
Handwheel control may be located anywhere



360° around motor shaft—



Belt may drive in any direction



REEVES SPEED CONTROL

Both dichlorides are better than methyl chloroform, and very much better than trichloropropane. Propylene dichloride could be used at a higher extraction temperature, at which superior results could be obtainable, although it is doubtful if this solvent would prove equal to trichloroethylene. Propylene dichloride would be cheaper in overall cost than ethylene dichloride, and would have a slight advantage in flammability rating.

Digest from "Preliminary Studies on the Application of Certain Chlorinated Solvents to Soybean Oil Extraction," by L. K. Arnold and R. M. Carvey, *Journal of the American Oil Chemists' Society*, 81-83, Feb. 1953.

CEREAL PRODUCTS

Musty Off-Flavor in Peanuts From BHC-Treated Soils

Eating quality of peanuts and peanut products is seriously impaired when certain insecticides are used to prevent damage to plants.

When benzene hexachloride (BHC) at rate of 1 lb. gamma isomer per acre, or lindane, 1 lb. per acre, were applied to fields with fertilizer, peanuts grown on the land had musty off-flavors. These flavors were slightly stronger with BHC, but both products impaired eating quality of unroasted, roasted, or salted nuts.

Peanut butter made from nuts grown on lindane-treated soils had musty off-flavors that made samples barely edible. When aldrin (4 lb./acre), dieldrin (2 lb./acre), or toxaphene (25 lb./acre) were added to soils, flavor and general acceptability of peanut butter made from nuts grown on them was as good or better than controls.

Oil from peanuts grown on BHC-treated soils also had a slight off-flavor, and when potatoes were French fried in it, the off-flavor was carried over onto them. This off-flavor became more pronounced with each successive batch of potatoes.

Digest from "Flavor of Peanuts and Peanut Products as Affected by Certain Insecticides Used in Growing Peanut Crops," by G. L. Gilpin, E. H. Dawson, E. L. Geissenhainer and H. Reynolds, *Food Technology*, 7, 132-35, March, 1953.

Germination of Barley Influenced by Drying

Artificial drying of cereal grains following combine harvesting is a necessity at times in the United Kingdom, and in the case of malting barleys, at least, effect of drying on ultimate germinative energy is highly important.

Since barley rarely exhibits normal

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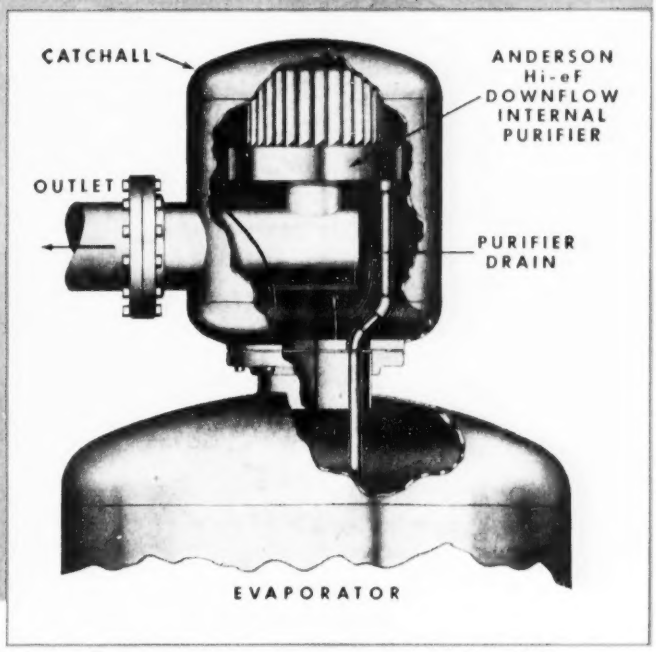

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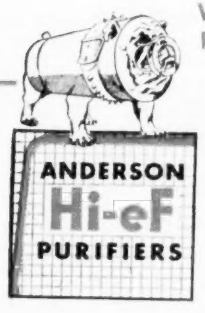

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Many large producers are successfully solving this ticklish sanitation problem by spray method chemical sterilization after cleaning. Equipment used is the portable Oakite Sprayer, Model 374. Germicidal agent is Oakite Sanitizer No. 1 (used at ½ fluid oz. per gallon of water.) Procedure: A few strokes of the sprayer's plunger develops ample air pressure for fast application of germicidal solution.

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germinative capacity until 3-4 months after harvest, much study has been given to methods of estimating germinating power during the dormancy" period (barley seldom has true embryonic dormancy), or immediately after harvest.

By peeling kernels so oxygen and moisture are able to penetrate to embryo, normal germination figures can be obtained at any time. This is a tedious process, and about three days are required to obtain results.

Chemical methods using sodium biselenite or tetrazolium chloride give more rapid indications, and since latter reagent is non-toxic, its results have been widely studied. It gives excellent correlation with germination tests on normal barleys, and can be applied satisfactorily during dormant period. The method gives high results on heated barleys, however, and if heat damage is severe, tetrazolium staining may indicate normal germination power in barley actually germinating only 20-60 percent.

Reduction of tetrazolium chloride is catalyzed by certain dehydrogenases which thus appear to survive death of the embryo, along with amylases, proteinases, catalases and others. Efforts to establish a relationship between tetrazolium staining and viability for different classes of barley may not be altogether wise, since variation in damaged grain can be very large.

Digest from "The Quality of Cereals and Their Industrial Uses, Viability Testing of Cereal Seeds," by Anna M. MacLeod, *Chemistry & Industry*, 289-291, March 28, 1953.

FRUITS & VEGETABLES

Flavor of Sweet Potatoes Affected by Insecticides

Sweet potatoes grown with benzene hexachloride either dusted on plants or used as a soil treatment had off-flavors which definitely impaired their eating quality and caused them to rate fair to poor in general acceptability.

Four experimental samples were grown with toxaphene, chlordane, DDT, and technical BHC as foliage treatments during growing season. Two samples were grown in soils to which chlordane and BHC were applied mixed with fertilizer. A check sample was grown without use of insecticides.

Only minor and insignificant differences among scores for absence of off-flavor were found in potatoes from plants treated with toxaphene or chlordane dust or with DDT emulsion spray, or grown in soil treated with chlordane. General acceptability of sweet potatoes from plants dusted with toxaphene was fair, from those

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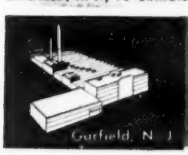
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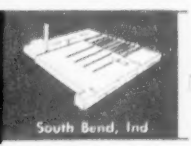
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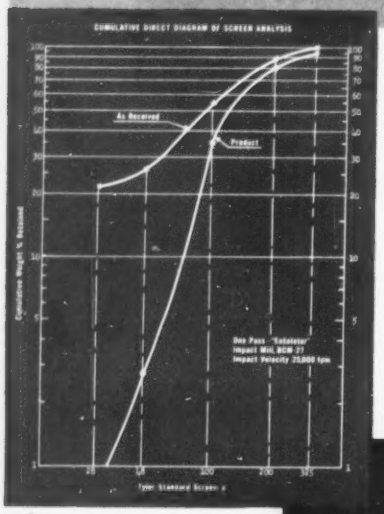

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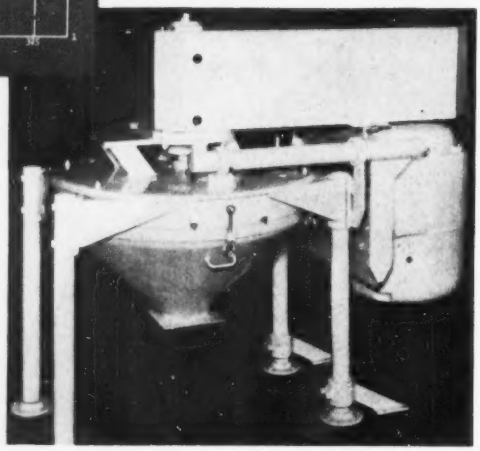
- **Capacity**...up to 10,000 pounds per hour or higher on friable materials

Typical particle size curves . . . before and after processing material on the "ENTOLETER" Impact Mill



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dusted with chlordane fairly good, and from plants sprayed with DDT or grown on soil treated with chlordane practically as good as controls.

Samples grown with use of BHC (either dusted on plants or added to the soil) emitted a musty odor when cut open after baking, and off-flavor in sweet potatoes from plants dusted with BHC was described by some judges as putrid, spoiled, or decayed. Those from plants grown on soil treated with BHC were less objectionable.

Digest from "Flavor of Sweet Potatoes as Affected by Certain Agricultural Chemicals Used as Insecticides," by G. L. Gilpin and E. L. Geissenhainer, *Food Technology*, 7, 137-38, March, 1953.

Improved Food Pectin

Low-methoxyl pectin with properties that make it more generally useful in a variety of foods than commercially available products, has been prepared in laboratory at WRRL by ammonia deesterification and acid precipitation in a single-phase, aqueous system.

Practical process for production of this pectin starting with fresh or dried citrus peel has been developed on a pilot plant scale. It comprises steps of: Preparing peel for extraction; ammonia deesterification of pectin in solution; acid precipitation of gel; dewatering and washing gel, and neutralization and drying of resulting product.

Digest from "Pilot Plant Production of Low-Methoxyl Pectin From Citrus Peel," by R. P. Graham and A. D. Shepherd, paper presented at ACS meeting, Los Angeles, March 18, 1953.

CONFECTIONERY

How To Add Lecithin To Chocolate Mass

Improved quality of chocolate resulting from addition of soybean lecithin arises from its lubricating action on particles of chocolate mass. For this reason additions are effective when made during conching, 25 percent at the beginning, and the remainder about 2 hr. later at 113-122 F.

Higher temperatures should be avoided, especially those of 212 or above, for off odors and flavors will develop. In the worst cases these resemble meat or soup extract flavors. Addition of lecithin to chocolate batches in kneading-type blenders, melangeurs, or roller mills is not practical.

All chocolate masses needing lecithin because of low fat content should be tested for minimum addition they

(Turn to page 204)

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255R Vanilla
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257F Chemicals
257G Folder SC-728
257H Calculator
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257K Sanitation
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266 Buls. 1025, 1080
267 Boxes
268 Hollow-screw processor

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June 1953

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Containers are placed wherever material accumulates. When loaded each is picked-up, hauled and emptied (as illustrated above) . . . or load set down intact. The entire operation is handled by only one man, the driver, by hydraulic controls in cab.

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require, and maximum they will tolerate. In general, casting, bitter, and coating chocolates without milk can use 0.25-0.40 percent. For milk chocolates the range should be lower and narrower, 0.2-0.3 percent. Commercial materials contain 60-65 percent pure lecithin.

For chocolate use, products of pale color and strictly neutral odor and taste are best, though darker colored lecithins of satisfactory flavor have been used successfully.

Digest from "Technical Working Methods for Additions of Lecithin to Chocolate," by Bert Schulz, *International Chocolate Review*, 2, 41-42, 1953. (in German).

BEVERAGES

Catalase Plus Ascorbic Acid Prevent Oxidation of Beer

Recent patent specifications reveal use of catalase and ascorbic acid in stabilizing malt beverages against oxidation.

An important obstacle to widespread use of ascorbic acid is its expense, which has tended to limit quantities to a point where it was ineffective in protecting beverage. When catalase also is used, considerably less ascorbic acid is required to attain desired results.

Amount of catalase used is extremely small and may be added any time subsequent to brewing stage and prior to packaging. It has been found, for example, that equal or better protection is obtained when catalase is used with one-half to one-fourth the amount of ascorbic acid required when used alone.

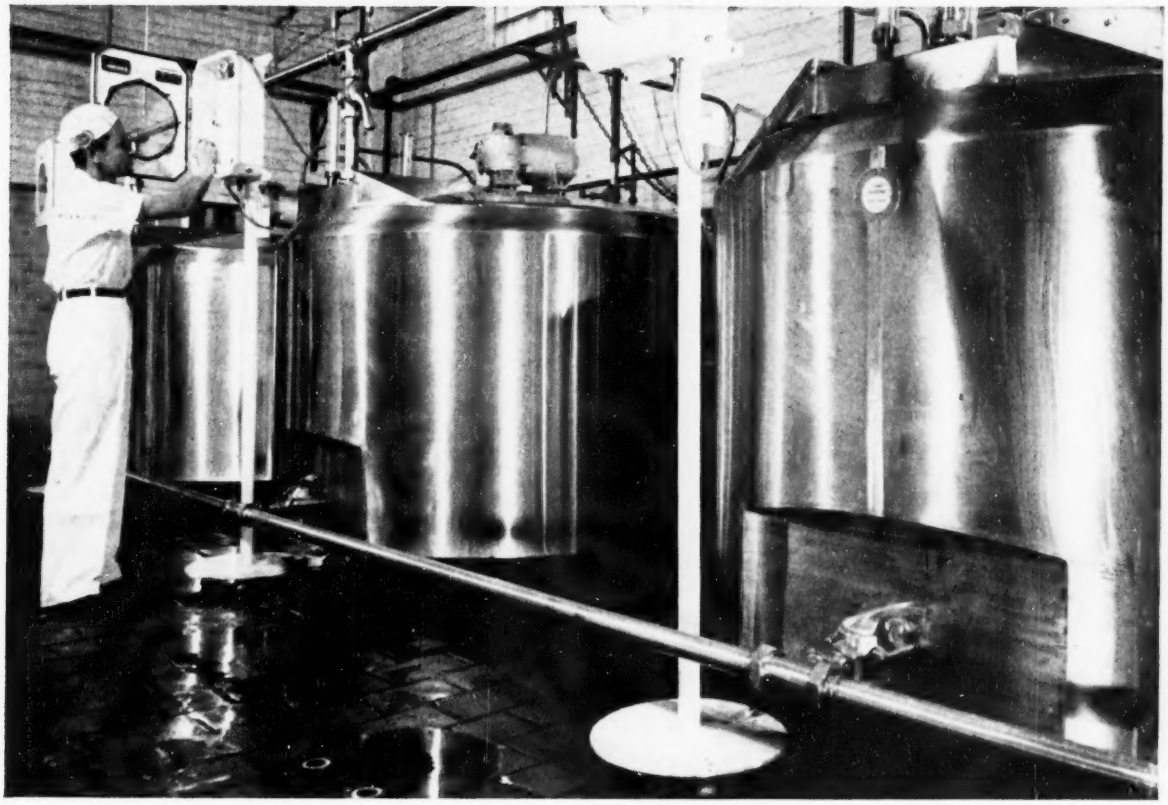
Digest from U. S. Patent 2,620,275, issued Dec. 2, 1952, on an application dated Oct. 13, 1948, to Philip P. Gray, Forest Hills, N. Y., assigned to Wallerstein Co., Inc., New York City.

FERMENTATION

Special Alcohol Formula Makes Best Vinegar

Vinegar produced from specially denatured alcohols in Frings-type commercial generators has the best quality when alcohol of formula S.D. 35A is used. This contains 5 volumes 85-88 percent technical ethyl acetate to 100 volumes 190-proof ethyl alcohol.

If a special S.D.35A containing still fractions known to improve vinegar flavor is used, quality is even better. S. D. 18 (equal volumes 90-grain vinegar and 190-proof alcohol), and S.D.29 (5 volumes 20 percent alcoholic solution of acetaldehyde to 100 volumes 190-proof al-



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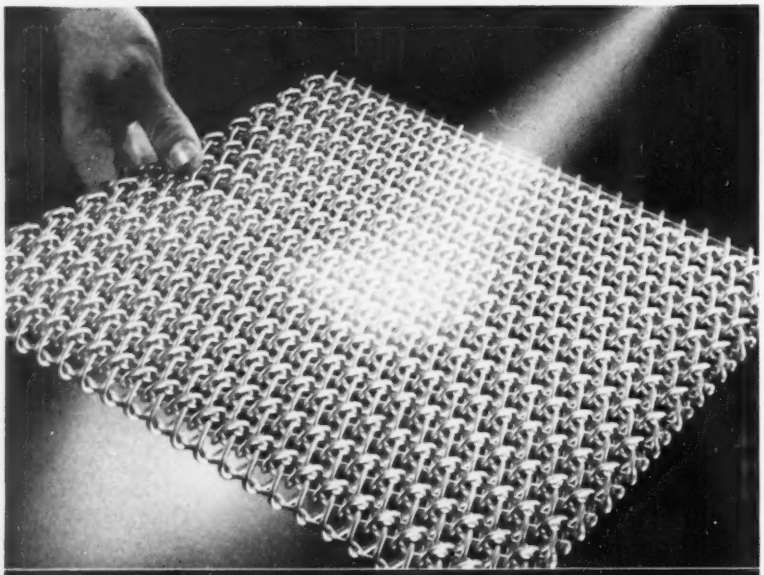

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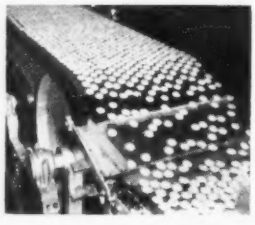
No solid surface to block heat circulation during baking or cooking . . . or cold circulation during cooling or freezing! Process atmospheres circulate freely through the openings in the wire mesh belt. This means faster, more efficient processing . . . a more uniform product since each piece is uniformly processed.

That's just one reason why WIRE MESH Conveyor Belts are superior to solid types of belting for food processing. Open mesh also allows free drainage of wash water or process solutions. All-metal belt has no odor, thus cannot contaminate the natural aroma of your product. Stainless steel, widely used for food processing belts, assures further freedom from contamination by giving lifelong rust protection. All-metal construction also gives long life, permits easy cleaning with steam or water.

No matter how you look at it, the best all-around conveyor belting for food plants is WIRE MESH . . . and the best wire mesh belts are made by Cambridge, pioneers in wire mesh belt fabrication. Cambridge belts are made in any size, mesh or weave and from any metal or alloy. Your Cambridge Field Engineer can recommend the best type for your plant. Look under "Belting-Mechanical" in your classified telephone book, or write for the Cambridge man nearest you.

BETTER BAKING
is assured here because open mesh permits oven atmosphere to flow freely around each cracker; open mesh also cuts heating costs by reducing heat absorption of belt itself. Cooler belts after the oven are also of wire mesh construction.



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illustrates and describes wire mesh belts, gives conveyor design information, specifications and metallurgical data. Write today.

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Food Engineering Reports
LATEST TECHNICAL NEWS
In Keeping Up With Field . . . . page 229

cohol) yielded vinegars of lesser quality, while unmodified alcohol gave a vinegar lacking in character.

S.D.35A is equivalent to undenatured alcohol in vinegar production, indicating that generators can use ethyl acetate for acetic acid production.

Toxic level for metals in vinegar mashes, established over a 2-yr. study, is (in ppm.) Pb 10, Cu 15, Fe 50, Zn 100, Sn over 100. Toxicity is evidenced by decrease in efficiency of generator and usually by an increase in residual alcohol in the vinegar.

Digest from "Operation of Vinegar Generators" by R. J. Allgeier, R. T. Wisthoff, and F. M. Hildebrandt, *Industrial & Engineering Chemistry*, 489-94, Feb. 1953.

—*End*—

New 1 Added to Old 5

—*Continued from page 50*

Metal enamel surface casings and stainless steel strips for trimming provide the ovens with a streamlined appearance.

To take care of expansion and contraction, baking units are secured to one another by flexible joints. All sheet-metal panels are removable. As a result, it is no longer necessary to remove the entire side of a long oven. What's more these panels have interlocking joints that do not require gaskets or cementing.

The new oven is also designed to eliminate need of baffles for uniform distribution of heat. It is insulated with 8 in. of Fiberglas on top and sides and with 7 in. on the bottom.

For removing products of combustion, dampers have been installed in the upper and lower section of each baking unit. These are, in turn, hooked up with an 8x24-in. duct concealed in the top of the oven.

Gas Installation Savings

The new oven is equipped with 150 gas burners. We installed a propane system, buying the liquefied gas in tank cars, and then storing it in an 18,000-gal. tank under 50-180 lb. of pressure. From here, it is brought into the plant under a pressure of 15 lb., and delivered by a 3-in. line to the six ovens.

Big advantage of using propane is in installation savings. City gas, sup-

plied under 1 lb. of pressure, required separate 4-in. pipe lines for each oven.

An automatic reducer lowers gas pressure below 1 lb. Gas is then piped to each baking zone, where it is mixed with air of low-pressure (under 1 lb.) in a Bryant unit. This enclosed, cone-shaped device uniformly blends air and gas.

To match modern-oven performance, integrated protective instrumentation is employed. Balanced temperature gradients of this multiple-zoned oven require very close control to be effective. And it is being achieved. For the oven "load" is now matched at every moment by twelve temperature controllers—an equal number for controlling the top and bottom sections of baking chamber.

These are hooked up with motorized valves that control flow of gas. When the oven temperature rises a few degrees above the control setting, instrument contact drives the valve to a predetermined low-flame opening. On the other hand, when the temperature drops a few degrees below the control point, then the low contact sends the valve back to full-flame.

Accent on Safety

Installed in the new oven is the latest approved safety features. On start-up, the oven exhaust system operates on a timer, which is set for 7 min.—a period sufficient for four complete changes of air inside the oven. Then gas valves automatically open and a spark ignites the fuel.

In the event of any failure in the gas, air, electric, or exhaust systems, the gas valve automatically closes. The oven must then be stripped to locate the source of trouble.

The new oven is also equipped with eight dampers (top and bottom) that can be opened and closed according to the type of product being baked.

Another critical oven variable—baking time—is now accurately controlled manually with the aid of an electronic tachometer indicating conveyor speed. A fraction-of-a-minute variation in oven time can ruin a lot of cookies.

Adjustments for lateral misalignments—up to 1¼ in. either way—of the 38 in.-wide and 315 ft.-long stainless steel band conveyor traveling through the oven, are continuously made by two devices at both ends of belt.

Also designed by author Wood, they (1) prevent damage to costly conveyor, (2) eliminate need for constant watching for misalignments and adjusting at both ends of the belt, and (3) curb "cripples" or broken cookies.

Here's how adjustments are continuously made: When the belt moves off center, a belt-guide roll then travels

Are you needlessly using two different machines when one Elec-tri-pak will do the job? Or, are you holding off automatic packaging because you think more than one filling machine is needed? You don't need to!

With Triangle Net Weighing and Filling Machines you can fill any number of product varieties with a single machine . . . running only *one* product or a wide variety of them. Fill salt to soap to macaroni and confections. Package into bags, boxes, cans, jars or what-have-you.

Chase Candy Company's Experience

For example, the Chase Candy Company fills at least 58 candies with just ONE of their many Elec-tri-paks. Weights may range from a few ounces to a few pounds or more. And, change-over is made from one to another in a few minutes!

Solve your problems with Elec-tri-pak equipment NOW. Get the complete facts in this new booklet, "Profitable Solution to Package Filling Problems." Write, wire or call.

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Air	Dye Solutions	Latex	Salt Water
Alcohol	Edible Oils	Mash	Shortening
Ammonia	Ethane	Methane	Sludge
Beer	Fish Oils	Milk	Soap
Benzol	Formaldehyde	Molasses	Sodium Chloride Solution
Boiler Feed Water	Fresh Water	Naptha	Sodium Silicate
Brewer's Mash	Gas, Manufactured	Nitric Acid	Sodium Sulfate Solution
Butter	Gas, Natural	Nitrogen	Starch
Butane	Gasoline	Oil, Crude	Sulphuric Acid
Cane Syrup	Glucose	Oil, Refined	Sump Water
Calcium Carbonate Slurry	Glue	Oxygen	Sweet Water
Calcium Sulfate Slurry	Glycerine	Paint	Tomato Juice
Casein Solutions	Glycols	Potassium Hydroxide	Varnish
Cement Slurry	Hydrochloric Acid	Propane	Vinegar
Chocolate	Hydrofluoric Acid	Raw Boiler Feed Water	Viscose
CO_2 Gas	Ink	River Water—Dredging Operations	Water (various)
Crude Oil	Jam	Rosin	Wax
Dairy Products	Jelly		Whey
	Ketchup		
	Lacquer		

THIS list of fluids will give you a rough idea of the diversity of pumping jobs in which Darcova Pumcups are responsible for really *big* savings.

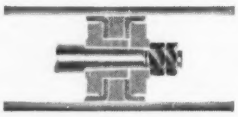
It boils down to the fact that Pumcups all but eliminate fluid slippage *throughout* their life span . . . and they *last many times as long as other packings.* Think of the down-time avoided, the production gains due to prolonged high efficiency, and the time-and-money-saving reduction in maintenance!

Years of application research have gone into the development of Pumcups. Made today in standard as well as many special compositions and textures for a wide range of temperature and pressure conditions, they offer you superior cost-cutting service in virtually *any* pumping job, simple or tough! And they're available in diameters from 1 to 20 inches.

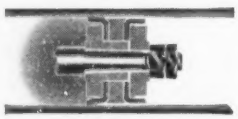
SEND FOR FREE BULLETIN

Why not weigh *all* the facts? Bulletin 4401 covers Darcova Pumcups for reciprocating pumps; Bulletin 4502 on Pumcups for air or hydraulic mechanisms. Write for yours today.

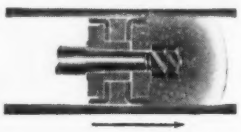
DIAGRAM OF DARCOVA PUMCUP ACTION (greatly exaggerated)



NORMAL: BOTH PUMCUPS RELAXED



UNDER PRESSURE: PUMCUPS SEAL AGAINST CYLINDER DESPITE WEAR, MINIMIZING SLIPPAGE



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PUMCUPS

in the same direction. Movement of the roll turns a gear that drives a rack to operate a microswitch (see drawing). The latter starts a motor that drives an adjusting screw to move one drum-shaft bearing for correcting belt position.

If the belt continues to travel off-center, the mechanism goes through the same sequence. Each time, the adjusting screw makes a $\frac{1}{8}$th-in. turn, until the band is centrallized on the drum. As long as the belt remains central no adjustment is made.

This mechanism will move the drum bearing in either direction, as required to center the belt. The adjusting screw is driven in either direction, as required, by a reversible motor.

New Protective Packaging

Cookies are cooled as they travel about 370 ft. to two packaging lines—the newest one for cellophane-wrapping them in $\frac{1}{4}$-lb. packets that are packed four to a carton, the other for random packaging into cartons.

As for Burry's packaging by the new "save-the-flavor" technique, here is how it's done:

Leaving the cooling belt, rows of cookies continue to a Baker-Perkins automatic stacker. This has a magnetic plate set at a 45-deg. angle. Magnetically held to this plate are vertical stacker plates. These extend about 4 ft. along the conveyor that feeds the wrapping machines. Cookies slide down the plate and contact a rotary, notched wheel that sets them up on edge between the stacker plates.

Stacks of 8-12 cookies (depending upon thickness) are fed to spacer pockets mounted on a single chain belt feeding a wrapping machine. Traveling through this machine, stacks of cookies are wrapped with heat-sealable cellophane. These packets of cookies are then packed four to a carton, which is then machine-overwrapped.

Now to the random-packaging method: A Battle Creek machine forms roll-fed laminated glassine into liners—the film being formed around mandrels mounted on a chain belt. Cartons, from unglued blanks, are then shaped up around the liners, which are glued to the bottom and strip-glued to the side of the cartons.

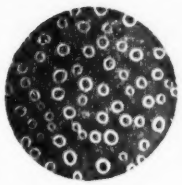
Then the containers continue to a six-head Elec-Tri-Pac filling machine. Speed of this filler is 70 to 90 per min., depending upon the cookies. Over- and under-weight packages are rejected from the line by an automatic check-weigher.

Liners are now automatically tucked inside the carton, and flaps are glued as they are tucked. Finally, cartons are waxpaper-overwrapped.

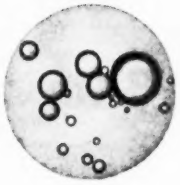
End (*Resume reading on page 50*)

RIGHT IN YOUR OWN BACK YARD...
BY WEST
BUGS KNOW IT'S THE KISS OF DEATH WHEN THE WEST MAN TURNS ON THE NEW ATOMIZER
A TWIST OF THE WRIST AND IN TWO MINUTES THIS PLANT WILL LOOK LIKE A LONDON FOG!
WOW! THIS JOB USED TO LOUSE UP THE WEEKEND FOR FIVE MEN. AT DOUBLE TIME!
WEST ATOMIZERS? WOW! WE'RE SITTING DUCKS IN THIS CRACK!
YOU'LL STILL SWING A MOP, THUNDERFOOT. THIS IS A BUG KILLER, NOT A JANITOR!
BET THIS BLOWS MY JOB RIGHT OUT THE WINDOW!
TRAPPED BY VAPOSECTOR! SAME DIRTY TACTICS THAT WIPED OUT OUR COUSINS AT THE CANNERY!
JIGS UP! IT'S THIS OR WEST FUMIGANTS OR WEST RESIDUALS!
WHAT STRATEGY! THEY'VE MAPPED OUT AN INSECT CONTROL PLAN THAT'S STOPPED US COLD!
HEY! WAIT A MINUTE... WHO'S GONNA CARRY US OUT?

Fog 1,000 cu. ft. in 3 seconds for 5¢



Top — Magnified photo of uniform 8 micron droplets produced by precision-machined suction nozzles of West Atomizing equipment. "Dry mist" remains air-borne for prolonged periods.



Bottom—Magnified photo of droplets produced by ordinary hydraulic compressor sprayers. Vary from 2 to 300 microns. Larger droplets fall, wetting floors and reducing effectiveness.

— and with only 1 ounce of Vaposector — for complete control of flying insects. Double this dosage for crawling insects.

Impossible? Not with a permanently installed West Atomizer. 10 suction nozzles atomize a "dry mist" of extra-potent insecticide. Droplets are so small they hang in the air . . . seep into every crack . . . penetrate delicate insect breathing tubes.

It's an unbeatable combination. High potency Vaposector — sprayed with super-efficient West atomizing equipment. One man does the job. There's only one valve to open. You can fog your entire plant simultaneously.

West has a complete line of insecticides and atomizing equipment ranging from permanent installations to portables. A West specialist will be glad to make a survey and set up an Insect Control Program to fit your needs. Without obligation. Just mail the coupon.

YES! Tell us about your Insect Control Plan

☐ Please send me the West Insect Control Booklet

☐ Have a West Insect Control Specialist call DEPT. 8

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

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To give you greater strength and a variation of dimensions, DEKALB tubular steel frames are welded in a jig as a unit... assuring lasting strength. No bolts to loosen, no unnecessary rattles and no maintenance headaches.

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Questions & Answers

THIS MONTH'S PROBLEM

Question—We would appreciate your suggestions on preventing discoloration of frozen noodles. We have been making home-made noodles, consisting of hard wheat flour, whole eggs, yolks, salt, and water. The mixture is kneaded and noodles are then hand-formed. Without drying, noodles are dusted with starch to prevent them from sticking to one another, packed into cartons, and then frozen. In about a week, the frozen noodles turned gray.

Answer to April Problem

The Question Was—We are concerned over shrinkage losses in processing peanuts into peanut butter. Can you offer any suggestions on reducing these shrinkage losses?

Answer—First, we suggest that you make a thorough survey of your operations to determine sources and magnitude of losses. Then you can concentrate on each one, and take necessary measures to reduce the losses.

A certain amount of shrinkage is unavoidable in processing peanut butter. Your survey should enable you to set up your own standard losses, against which day-to-day operations can be routinely checked.

As a start, make certain that amount of raw material charged into the process is correct. While losses attributable to torn bags, underweight bags, and spillage are small, they are cumulative.

You will probably find the greatest loss is due to roasting. It will vary somewhat with moisture content of the nuts. By weighing and analyzing the moisture content of several batches before and after roasting, you will have enough data to enable you to predict with reasonable accuracy, roasting losses from moisture content of nuts. This is predicated on roasting to a fairly uniform finished color. So, if you switch to a darker or lighter roast, it will be necessary to re-check roasting losses.

Blanching losses can usually be directly weighed in terms of amount of hearts and skins removed from nuts. Both are controllable within limits by making adjustments on blanchers. And your standards for flavor and speck count will govern these adjustments.

However, there are possibilities of

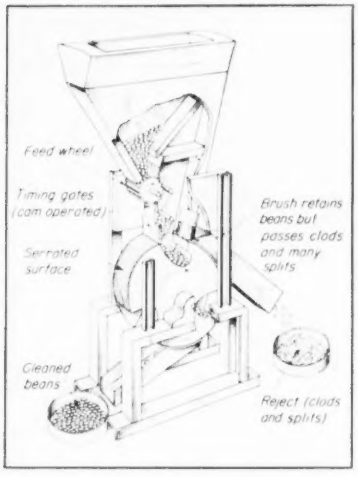
reducing these losses without adversely affecting product quality. For example, an examination of the heart rejects may reveal presence of usable nut meats mixed with bitter heart kernels. Kernels are somewhat spherical, whereas meats are frequently jagged and flatter. Therefore, if you run the hearts over a screen with round perforations only slightly larger than the hearts, a fairly good separation of usable fragments of meat can be obtained and returned to the process for milling.

Similarly, it is often found that skin waste contains a substantial amount of fine peanut meal rubbed off with the skins. In this case, a vibrating sifter may recover some of this meal.

More on Clay Lumps in Beans

Referring to your March problem, you might be interested in knowing that lumps of clay can be effectively removed from dried shelled beans by a device invented by H. B. Walker, C. E. Barbee, and W. P. Berggren, of the Agricultural Engineering Dept., University of Calif.

This device has been in commercial use for several years, and is manufactured under license by Baccei Brothers, Woodland, Calif.



Operation of bean cleaner (see diagram of preliminary working model) is simple. Device functions by difference in roughness of surface of beans and clay clods.

Cam-operated timing gates deliver beans to serrated, revolving cylindrical surface. Clods are carried under doffing brushes by friction. Beans are retained on surface, and then swept into pockets for delivery into clean bean chute.—*Russell L. Perry, Acting Chairman, Dept. of Agricultural Engineering, University of Calif., Davis, Calif.*

Don't take chances with food wrappers

PLAY SAFE WITH

NON-TOXIC

PATAPAR

When selecting a packaging material that is to come in direct contact with food, make sure it has no toxic qualities that could be imparted to the food.

You can have utmost confidence in Patapar Vegetable Parchment. This high wet-strength, grease-resisting parchment is absolutely NON-TOXIC. The basic Patapar is 100% pure cellulose, tasteless, odorless — nothing added. It meets every requirement of the Federal Food and Drug Act.

During the past 67 years, Patapar has faithfully protected butter, cheese, poultry, ice cream, fish, celery, sausage, ham, lard, bacon, margarine and many other foods. It is furnished in sheets or rolls — plain or beautifully printed with colorful designs.

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FOOD PLANT FLOORS
...the realistic solution to food floor protection.

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Making "Hot Dog" Relish

Question—Can you tell us the steps to follow in manufacturing a hot dog relish?

Answer—Basically, this product is a mixture of prepared mustard and chopped vegetable relish. The proportions, however, can be varied to suit the individual taste. Naturally, economies will somewhat limit the amount of the more expensive chopped vegetables. Somewhere between one-third mustard to two-thirds relish will probably give you what you want.

Prepared mustard may be made by any of various formulas. Mustard seed (brown, yellow, or a mixture) is suspended, after preliminary cleaning and cracking, in a dilute vinegar solution containing the desired spices and seasonings. The resulting mash is then ground to a finished mustard in a stone mill. Newer type, direct-motor-driven, vertical mills produce about 50 gph.

Onions, pickles, and other desired brined and pickled vegetables are chopped to relish consistency in either a comminuting machine or rotary knife cutter. It is suggested that corrosion-resisting metals be used in the construction of equipment for handling this product.

Mustard and vegetables are then weighed into a mixer in the desired proportions. For mixing, a gate-type or double-motion type agitator is desirable, since both major ingredients are of different characteristics.

Filling is accomplished either manually or with a piston-type filler. If a filling machine is employed, it should have corrosion-resisting contact parts. Also an agitator should be provided in the feed hopper to maintain uniform product consistency.

How Would *You* Do It?

Readers are invited to submit to FOOD ENGINEERING answers to questions in this department, especially to "This Month's Problem." Selected answers will be published, with credit (unless you specify otherwise). We pay space rates.

What is *Your* Problem?

Subscribers also are invited to send in food engineering questions. We undertake to provide answers, free, to the best of our ability. We do not undertake costly investigations. Give full information and your name. Your identity will not be disclosed.

Write to Questions & Answers, Editor, FOOD ENGINEERING, 330 W. 42nd St., New York 36, N. Y.

Modifying Puddings and Fillings

Question—As a manufacturer of starch-base puddings and pie fillings, we are concerned with the problem of variations in texture of the finished products due to non-uniform cooking. Housewives either boil the products too much or not enough. Often, a few air bubbles rising to the surface of the pudding or filling are considered evidence of a full boil. Such products are insufficiently boiled and they become soft and runny. Those that are overcooked are stiff and pasty. Can we modify our products to overcome this problem?

Answer—In recent years, highly refined Irish moss extractives have been developed which can be included with starch in manufacture of pudding mixes or pie fillings. Being extremely compatible, they easily cook to provide a proper "set" well below the boiling temperatures necessary for starch.

These seaplant extractives are very strong milk-gelling agents—one part replacing 12-15 parts of starch. When used to modify a pudding or pie filling, they provide a portion of setting properties. They are soluble and activated at temperatures considerably below the boiling point.

Irish moss extractives are thermally reversible—being fluid when hot and setting only when cool. Starches thicken (when brought to a boil) to a solution so viscous that it is not an easy matter to determine when solution actually boils.

Therefore, a more uniform gel structure will be produced in finished products made up with some seaplant extractive and starch. And over- or under-cooking will no longer be a problem. — *Answered by Seaplant Chemical Corp., New Bedford, Mass.*

Has Off-Odor in Pickles

Question—What's the cause of a train-oil smell in opened jars of vinegar gherkins, and what can be done to prevent it? We pack a fermented gherkin from which salt has been removed. Finished product contains 1.0 percent salt and 1.75 percent acetic acid. Vacuum in jars is about 15 in.

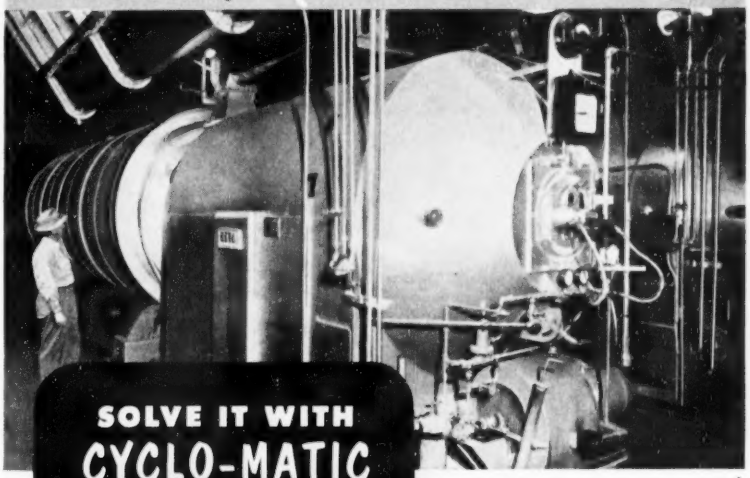
Answer—This off-odor problem appears to be attributed to enzyme action and is not uncommon in pickles.

After opening an hermetically sealed jar, air comes in contact with pickles. Oxygen then activates such enzymes as peroxidase, causing off-odors and flavors which are characteristic of enzyme action.

Presence of salt and acid in amounts desired for pickles is insufficient to

WHAT'S YOUR DEHYDRATING PROBLEM?

Cost? Product Quality? Space Limitations? Vitamin Loss? Uniform Color and Dryness? Fuel Consumption? Installation?



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CYCLO-MATIC Drying solves the dehydrating problems listed above, and many more, by its efficient application of the "flash" drying principle and simple 3-pass drum design, an exclusive Heil feature.

The three drums of the dryer are arranged concentrically, one within the other, all mechanically interlocked and rotating at the same speed. Material enters the center cylinder at the burner end. As it progresses, it is repeatedly carried to the top of the cylinders by built-in flights and showered through the drying medium. Rapid moisture evaporation keeps material relatively cool (130°-155° F.) as the drying fan draws it through the center cylinder, then back through the intermediate cylinder, and forward again through the outer cylinder. Velocity and heat of the air stream are different in each of the three drums to meet changing rates of evaporation. Maximum exposure of all particles to the heated air in a "flash" of time assures maximum retention of all vitamins and nutrients in the material.

Find out about the many other features that help you increase product quality at lower cost. Send the coupon for bulletins.

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Many other products and wastes of the beverage, canning, meat packing, confectionery, dairy, milling, and other food processing industries.

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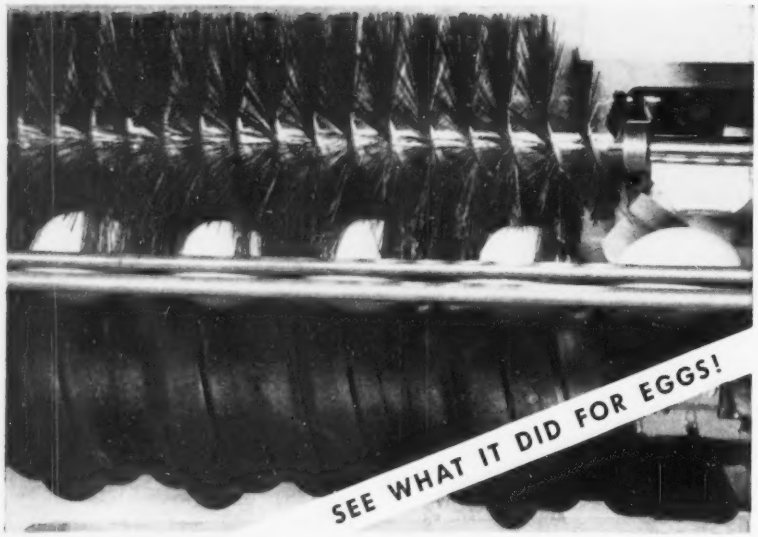
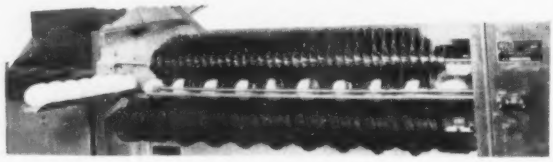


HELP FOR FOOD ENGINEERS

from *FULLERgript BRUSH* Development Staff



This egg washing machine features non-immersion scrubbing — brush-plus-vacuum drying — knife-edge weight scale.

You *could* have problems as ticklish as this one of cleaning eggs. In this case it took a year of experimenting. During that time Fuller engineers devised various brush leads, loadings, sizes and speeds. Through Fuller Brush cooperation our customer has produced a machine that for thorough washing gently revolves eggs along a rubber roll against a thin, spiralled, revolving brush. At this time the eggs are sprayed and scrubbed. Then the eggs pass along another roll for drying under a fluffier revolving brush in a vacuum chamber. Consequently, this machine alone is able to wash hatching eggs!

These same Fuller engineers have developed brushing components for most every phase of the food industry. Write and tell us about your process, your equipment and problem.

FREE *to Engineers with Imagination.* That you may visualize how our type of brushing may be employed with your equipment, we shall also send you a short, sample strip of Fullergript — when you write telling us about your processing problems.

INDUSTRIAL Fuller BRUSH CO. DIVISION

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destroy or inactivate enzyme systems. Heating jars so temperature of 165 to 170 deg. F. is attained in center of the pickles would be sufficient to destroy the enzymes and prevent subsequent loss of quality — especially after the jars have been opened for several days.

Pasteurization in this particular instance is recommended because the acidity indicated is slightly low for preservation of pickles. Inasmuch as this is apparently a sour pickle and unlike sweet pickles, acidity cannot be increased without affecting flavor, pasteurization would serve the dual purpose of inactivating enzymes and controlling possible spoilage by aciduric microorganisms.

Query on Humidity Absorption

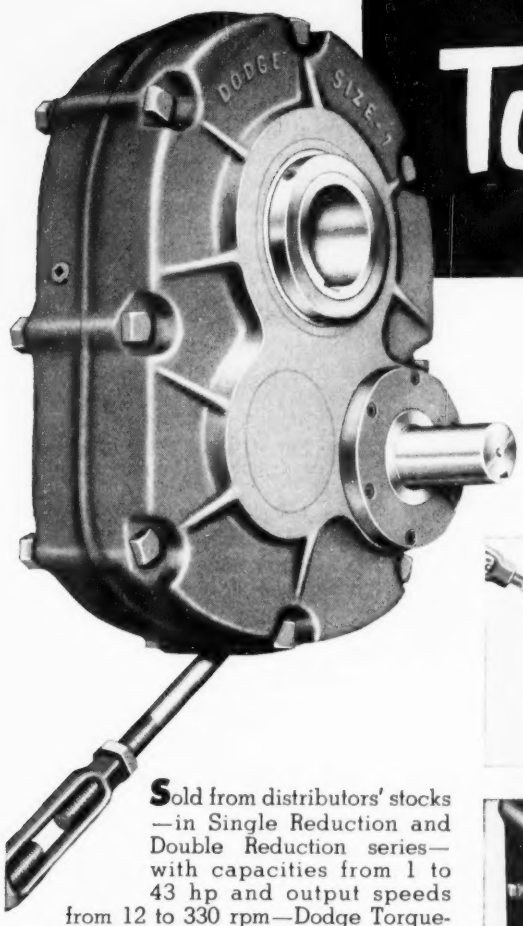
Question—We manufacture Spanish-type sausages (chorizos), which are hung in rooms until they lose 25 to 30 percent of their moisture. During cool, dry days, this loss in moisture content normally takes 10 to 15 days. On the other hand, this loss takes 20 to 25 days during wet, humid days. Moreover, molds grow on the sausages under high humid conditions, and result in loss of product. Since it is easy to regulate the temperature of our curing room, we have considered absorbing the moisture with lithium chloride, which has a high-moisture-absorption capacity and can be easily regenerated. Have you any suggestions on controlling the humidity in our curing room?

Answer—Evidentally, you are considering controlling humidity in your curing room by an inexpensive bulk-chemical system. This system calls for hanging a 50-lb. bag of lithium chloride in the center of the drying room and replacing it when moisture can no longer be absorbed.

We should point out, however, that lithium chloride is much more expensive than calcium chloride, which costs about $22 a ton. Moreover, these chloride salts are difficult to redry due to bonding of the water molecule. Therefore, we might suggest that you consider using activated aluminum, which is initially more expensive but can be redried at 170 deg. F. and reused.

Crux of good sausage curing is precisely controlling rapidly circulating air. This method of using high-velocity air would cure your mold problem, especially during rainy periods.

In the long run, the cheapest and most effective solution would be installation of a unit cooler and blower. Essentially, this unit consists of a spray-type dehumidifier, heating coils, and blower. Air is drawn into the de-



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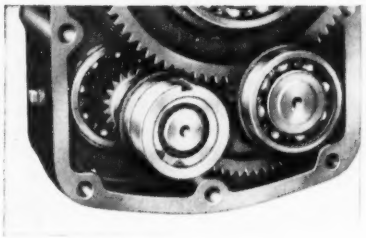

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No special engineering required. No foundation to provide. No flexible couplings. No sliding base. No lining up difficulties. No expensive installation. Stock Taper-Lock sheaves prescribed for each job to provide desired speeds. Application to other machines is practical and easy.

Unit is driven through any V-Belt Drive. Torque-Arm, fastened to any fixed object, anchors the reducer unit. Turnbuckle provides fast and accurate adjustment of belt tension.

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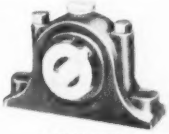

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8 MORE processing problems solved by Beckman Spectrophotometry!

Now saving time and money in 8 operations, the Beckman Model DU Flame Spectrophotometer with accessories used in this true case history was originally bought for only one job. No other single analytical instrument, with the possible exception of the Beckman Model B Spectrophotometer, is capable of carrying out this highly varied list of uses . . .

1. Rejects Immature Grapefruit
Real Gold Citrus Products rejects immature batches and maintains high quality of grapefruit by determining naringin content. This bitter factor, formerly measured on an inaccurate taste basis to judge immaturity, is now found *accurately* with the Beckman Model DU.

2. Controls Shut-Down Time
Because hesperidin content of orange juice varies seasonally, this company was previously unable to predict shut-down time to remove precipitant coatings from heat-exchanger surfaces. Time is now accurately computed and production control is more precise with Beckman Model DU.

3. Higher Quality—Lower Cost
Controlling Cu and Fe content of sugar syrup to few parts per million prevents reduction of Vitamin C in orange base canning. Real Gold maintains long life of Vitamin C in storage by rejecting all raw materials with excessive Fe-Cu levels. Rapidity of analysis with Beckman Model DU Flame Spectrophotometer speeds production at lower cost.

4. Greater Accuracy
Accurate determination of parathion residue in peel oil with Beckman Model DU insures pure flavoring ingredient. Procedure replaces conventional small-tolerance methods.

5. Maintains USP Standards
AOAC standard method used with Beckman Model DU to control citral quantity on every shipment of lemon oil demonstrates increasing versatility of this precision instrument.

6. Galacturonic Acid Study
High galacturonic acid in citrus is believed to be an indication of degree of ripeness. Fruit maturity controls are now being studied using Beckman Model DU.

7. Storage Controls
Evaluating ageing by color change in juices in storage is now simplified with Beckman Model DU Spectrophotometer and Reflectance Accessory.

8. Determines Soil Needs
Research study is now underway to evaluate orchard soil needs by determining mineral content of ash from juice. Objective—to insure higher quality at growing points.

FOR MORE COMPLETE DETAILS
ASK FOR DATA FILE 33— 18

Real Gold Citrus Products, Anaheim, California, obtains speedy production control with Beckman Model DU Flame Spectrophotometer, plus accessories.

these BECKMAN INSTRUMENTS used!

Model DU Flame Spectrophotometer
Providing high resolving power for quantitative determinations of more than 40 elements, the Beckman Model DU Flame gives Real Gold Citrus Products low initial cost and low operating cost (non-technical personnel).

Model DU Reflectance Accessory Set
Because citrus solutions contain too much colloidal foreign matter to allow accuracy with *transmitted* light—the Beckman *Reflectance* Accessory Set gives accuracy for measurements of diffuse reflectance from opaque, colored samples in liquid, powder or solid form.

Complete specifications on this Beckman equipment come to you with Data File offered above. *Write for your copy today!*

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humidifier, where cold-water sprays cool it to desired temperature. Cooled air—with its moisture content also lowered—is heated by the coils to desired room temperature. Blower then forces dehumidified air through a duct to various outlets in the curing room. A return duct delivers the air from the room to dehumidifier.

Cooling forces excess moisture from air, thereby resulting in a decrease in relative humidity when air is reheated to drying room temperature. To be successful, the predrying air must be held exactly at the specified humidity and temperature. For this purpose, an electronic controller regulates a back-pressure valve on the ammonia line which chills the water sprayed into the air. Also, a temperature controller proportions steam to heating coils to warm air when necessary.

In this way, control is consistently within 1 percent humidity and 1½ deg. F.

Since your problem occurs primarily during rainy days (when drying takes longer and mold growths occur), the use of a chemical deliquescent may be inadequate. A unit cooler and blower should cost in the neighborhood of $500. And if you have an adequate supply of cold well water, it might be possible to operate the dehumidifying chamber without refrigeration. However, if you seek accurate control, it may be necessary to install a reefer system.

Mushroom Catsup Formula

Question—Recently, one of our large western distributors called for a shipment of mushroom catsup. This distributor was advised that we are not manufacturing this product. Now we have received a request for a sizeable shipment of this item from still another distributor. Do you have a formula for making this type of catsup? And can you reveal any information on processing this catsup?

Answer—Mushroom catsup is popular in certain areas throughout the Rockies and Sierras, where it is employed as a flavoring sauce on steaks and roast beef.

Actually, there are two principal steps in manufacturing a catsup of this type—marinating the mushrooms, and then cooking the juice with spices.

As to the first step—marinating—add 100 lb. of salt to every 50 lb. of trimmed, washed mushrooms. After holding the salted mushrooms three days at room temperature, press the juice from the mushrooms.

Now to the second step. To each gallon of juice, add the following ground spices: Ginger, ¼ oz.; cloves, ¼ oz.; black pepper, ½ oz.; and mustard

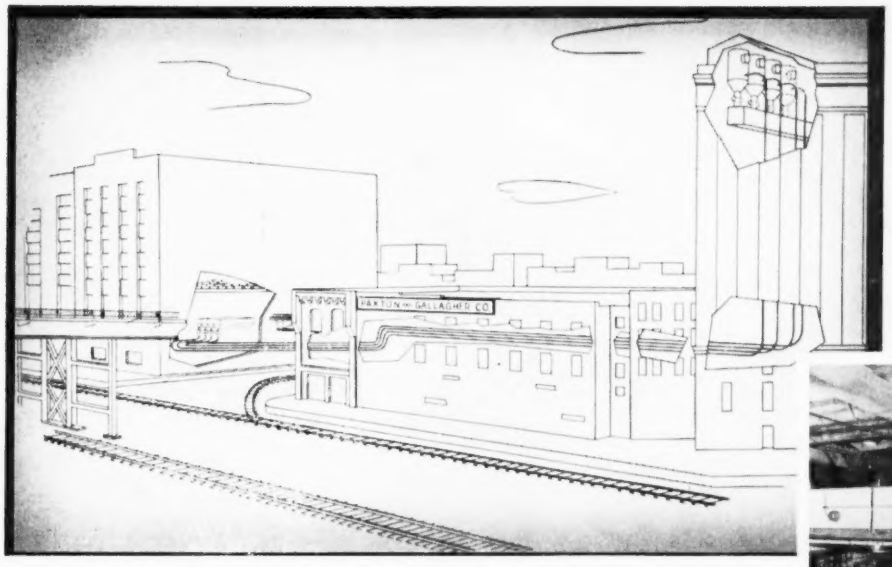


Diagram showing location of Dracco conveyor installation at Paxton and Gallagher Co., Omaha, Neb., which carries coffee from storage bins, over a rail siding and under a vehicle bridge, through three buildings and up to the receivers and roasters on the ninth floor of the final process building.

Imagine trying to do this ANY OTHER WAY!

THE CUSTOMER PROBLEM—To improve the slow and costly method of handling bulk coffee beans over a route that included (1) a four-floor elevator drop to a siding, (2) a hundred-yard rail haul, and (3) a nine-floor elevator lift to final processing equipment. The work included two loading and two unloading operations.

THE DRACCO ANSWER—A Dracco Pneumatic Conveyor now transports the coffee *automatically* at 36 tons per hour! It is carried through a completely enclosed sanitary system directly from the storage floor to the final processing machines.

THE RESULT—Slow manual and mechanical materials handling was eliminated, plant capacity was substantially increased, and operating costs were reduced to a minimum.

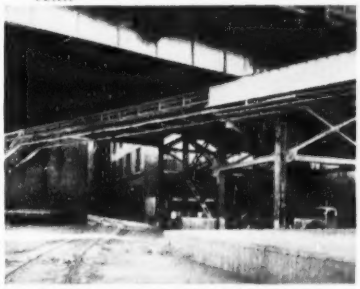
This cost-saving materials handling installation is typical of the modern technique of handling dry bulk materials with Dracco Pneumatic Conveyors.

DRACCO CORPORATION

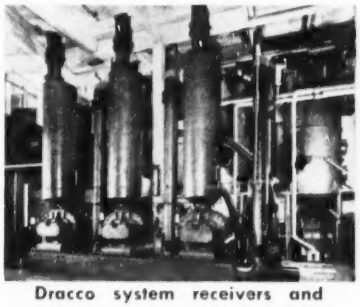
Harvard Avenue and East 116th St. • Cleveland 5, Ohio

Further information on the advantages of Dracco Pneumatic Conveyor as related to your materials handling problem may be had by contacting the nearest Dracco representative or Dept. W-2, Cleveland, Ohio.

Surge hoppers receive coffee beans from blenders. Coffee is automatically fed from these hoppers into the conveyor system.



Trestle between buildings supporting conveyor pipes over rail siding and under vehicle bridge.

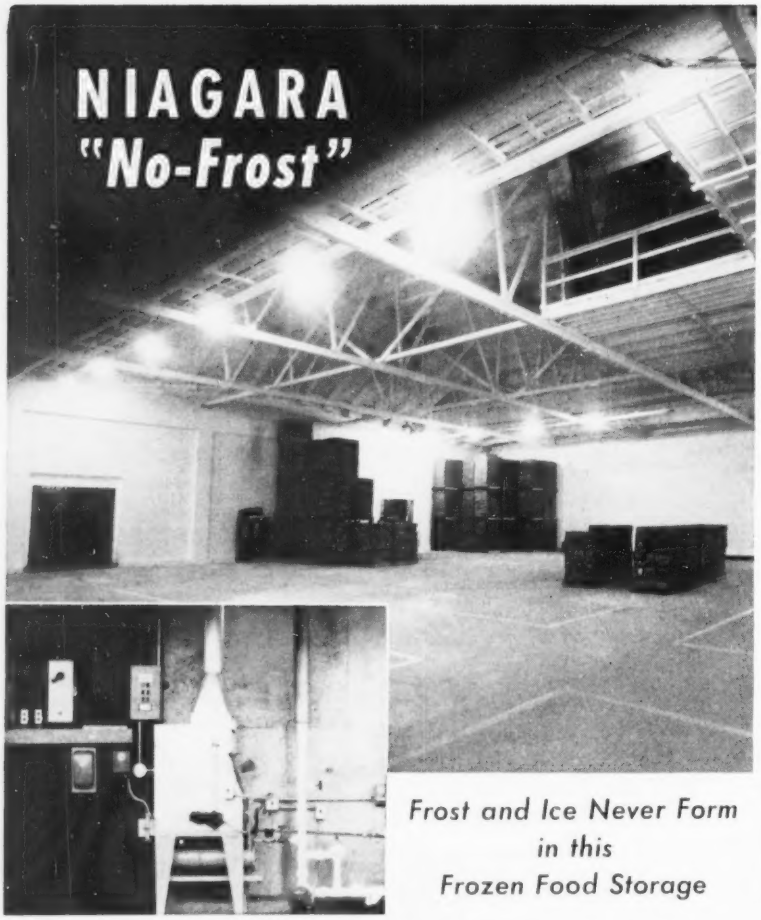


Dracco system receivers and vacuum pumps on the ninth floor of the final process building. Each of the pumps creates the vacuum used to transport 12 tons of coffee beans per hour.

DRACCO *Performance Proved*

DUST CONTROL EQUIPMENT • PNEUMATIC CONVEYORS

For more information, use coupon on page 201.



Frost and Ice Never Form in this Frozen Food Storage

SAVE TROUBLE AND EXPENSE EVERY DAY IN PRE-COOLING, FREEZING AND STORAGE; PROTECT FRESH OR FROZEN FOOD QUALITY

The Niagara "No-Frost" Method gives you always the full capacity you paid for in your refrigeration, NEVER, not even partially, interrupted for defrosting. You can handle large "live" loads easily. The controls are simple and always give you accurately the temperature and humidity you want. Temperatures never rise to interrupt the "pull-down". You are free of troubles; your rooms stay clean and sweet with easier maintenance and less labor. You save power; your compressors run at higher suction pressures. For every refrigerated room for temperatures below 32° F. this method gives you better product quality at lower operating costs. Many of the finest installations in the industry, both large and small, prove the benefits of the Niagara No-Frost Method.

Write for the No-Frost story and data on its application to your problem. Ask for Bulletin No. 105.

NIAGARA BLOWER COMPANY
DEPT. FI405 LEXINGTON AVENUE, NEW YORK 17, N. Y.

OVER 15 YEARS OF SUCCESSFUL EXPERIENCE PROVES THE VALUE OF NIAGARA NO-FROST

seed, 2 oz. Also add 2 oz. of pimento and salt to taste.

Boil the mushroom juice and spices about 10 min. in a steam-jacketed kettle. Transfer the batch into a vat, and allow it to stand for one week. Then strain the mixture through cheese cloth or a fine-mesh screen.

At this stage, the catsup is ready for bottling. Heat the batch to boiling, immediately fill hot into 2- or 4-oz. bottles, and then cap. No further heat processing is required, since the product will hold up without danger of spoilage.

Test for Egg Performance

Question—Is there a simple test for dehydrated egg products which would tip us off on their performance in prepared cake mixes?

Answer—Many chemical and physical tests can be employed. However, none will provide you with results that will correlate with performance of the egg product in the mix. Only true measure of performance of an egg product in a mix at present is to bake a cake and then evaluate its quality.

Other tests—odor, color, and flavor—are usually of value in determining the suitability of dried egg products for prepared mixes.

Tests that can be used to measure the quality of albumen are for moisture, protein, pH, reducing sugars, and granulation. In some cases, whipping tests are carried out. Most of these tests are desirable for evaluating the quality of dried yolk and whole egg. Additional tests can be run for color, fat content, and total bacteria.

At present, there is need for a whipping test, which could be used to measure the ultimate performance of albumen in an angle food cake mix.

Potato Chips Change Flavor

Question—As a small manufacturer of confectionery products, we have just started to process potato chips to level our seasonal production. Primary difficulty confronting us is the development of a fatty, somewhat objectionable flavor in the chips about two weeks after they have been fried and packaged. The potatoes are sliced to a thickness of 1 mm. and then deep-fat fried at 320 deg. F. in cottonseed and arachid oils. Can you suggest how we can overcome this off-flavor?

Answer—First, we suggest you increase your frying temperature to 375 deg. F. With higher frying temperatures, less oil is absorbed by the chips. Any excess fat will soak into a package and result in surface rancidity within a short time. Off-flavors may even occur in greaseproof packages, because of corner and fold fractures,

cut edges that receive no coating, and even failure of some of the glazes to prevent fat soakage.

Second, it is quite possible that the reverted or practically rancid flavor is attributed to undeodorized oils. Normally, any well refined, deodorized corn, cottonseed, or peanut oil will fry chips that will hold up well under proper storage conditions. Hydrogenated deodorized vegetable oil or lard (the latter stabilized) are also satisfactory.

None of these fats will impart a fatty taste to chips packaged in a sealed, grease-proof bag after two weeks of storage at room temperature.

Defrosted-Food Indicator

Question—Can you suggest a method to indicate whether packages of frozen food have defrosted and then refrozen after leaving our plant?

Answer—We know of two indicators that give visible indication of exposure of frozen-food packages to thawing temperatures.

One indicator, developed by researchers at Cornell University, consists of a gelatin gel enclosed in an oxygen-permeable transparent envelope, which is placed in each frozen-food package. Inside gel are an oxidizing enzyme—a colorless phenolic compound that can be oxidized to a dark color—and a suitable concentration of ascorbic acid. Enzyme remains colorless while product is frozen, and turns black when food is exposed to thawing temperatures. Ascorbic acid controls rate of color development.

Other indicator comprises a strip of filter paper containing a dyestuff and an organic solvent (melting point 40-65 deg. F.). Filter paper is encased in transparent tube and attached by adhesive, to package.

If package is exposed to thawing temperatures, solvent melts and dissolves dye. In turn, dye diffuses, indicating that food has defrosted. For further details on this indicator, refer to U. S. Patent No. 2,560,537, assigned to the U. S. Secretary of Agriculture.

Accenting Flavor of Beverages

Question—We are interested in knowing what mineral salts can be added to carbonated beverages to bring out their flavors.

Answer—Sodium chloride is perhaps the only mineral salt that can accentuate a flavor in a carbonated beverage.

In the case of specific beverages, certain salts favorably influence the flavor of the drink.

Whether it is comminuting:

FISH FRAMES *to a finished cat food as shown above*

CHICKEN NECKS AND BACKS *to a fine edible paste as a base for many foods*

MEAT TRIMMINGS *to a devilled meat*

CHICKEN AND TURKEY BONES *to a puree for a food base*

CHICKEN SKINS *for gravy*

LOBSTER FRAMES *to a base spread*

HAM CHUNKS *for minced ham and sandwich spread*

GREEN ANIMAL BONES *for mink and dog food*

ENTIRE CHICKEN OR TURKEY CARCASS *to a fine paste for "TV" spreads*

and for many other similar edible and inedible processes, a FitzMill Comminutor of proper design and capacity is available in stainless, non-corrosive construction . . . easy to clean . . . compact . . . maintenance free . . . labor saving.

— TURN YOUR WASTE INTO DOLLARS —

ASK FOR A FITZ ENGINEER TO ASSIST YOU IN YOUR PROCESSES

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1001 WEST WASHINGTON BOULEVARD
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NEW YORK • BOSTON • PHILADELPHIA • SPRINGFIELD • SAN FRANCISCO • TORONTO
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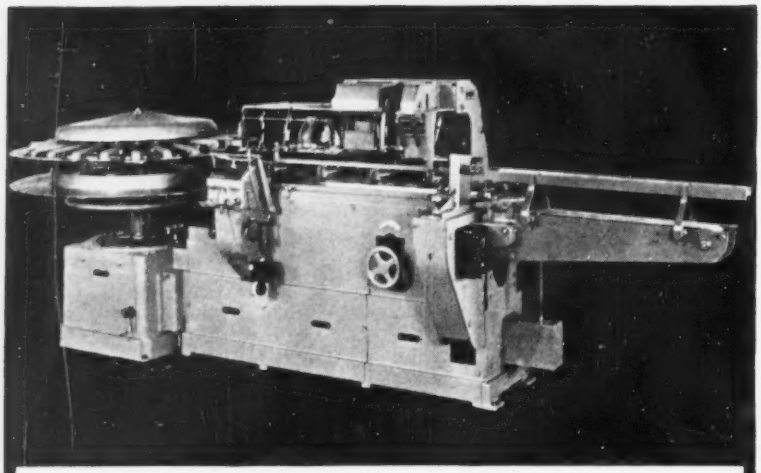


SEALTITE Bag Sealers

CUT BAG CLOSING COSTS

● SEALTITE functions efficiently with any standard gusseted paper bag. No special, premium priced bag is necessary.

● Works with any material usually packed in a paper bag — sugar, salt, flour, coffee, etc.

● Delivers a square, flat-topped, sift-proof package that may be stacked like a carton.

● Settles, shapes and seals 30 to 50 bags per minute.

● Users report production increased and packaging costs reduced as much as $500.00 *per month per machine.*

Write for complete information

CONSOLIDATED PACKAGING MACHINERY CORP.

1400 West Ave., Buffalo 13, N. Y.

For instance, sodium citrate will bring out the citrus flavor in carbonated lemon drinks. Also in carbonated lemon drinks and pale dry ginger ale, the sugar, acid, and carbonation ratio is an important factor. Take the case of a raspberry beverage, an increase in the amount of sugar, together with the addition of more fruit acid, will strengthen the flavor.

Taking Iron Out of Wine

Question—Samples of our white wines—sauterne and chablis—were analyzed by a local chemist to determine why they became hazy. He reported that the cloudiness was attributed to the presence of 10 to 65 ppm. of iron in the wines. But he failed to tell us what we could do about it. Have you any ideas?

Answer—Best way to remove the iron is by blue-fining—precipitation of the iron by the addition of potassium ferrocyanide under carefully controlled conditions.

There is, however, considerable reluctance to using this chemical because of possible health hazards involved. The Food & Drug Administration does not approve such practice. It will hold the winemaker responsible should the use of cyanogenetic compounds have a deleterious effect upon a consumer.

The use of ion-exchange resins have not been successful in certain cases.

We suggest that the best way to avoid iron clouding of wines is to employ preventative measures. Survey your entire operation to determine where the wine comes in contact with iron, or even copper. Then take steps to protect the wine from these metals.

—End—

"Double-Quicked" Packages

—Continued from page 62

Cars are unloaded by portable, roller, gravity-conveyor sections that extend right into the carrier. Cartons then move up a hinged incline power-belt conveyor to the second floor, where a series of ceiling-hung belt and gravity conveyors distribute them to the filler lines below.

Six filler stations are served by the system. Automatic switches and electric eyes keep the jar supply constant to each filler and also are set up to switch specific cartons to designated lines.

Leaving the distributing conveyor, an empty-jar carton rolls down a gravity conveyor and posts itself to the right of the filler station operator. The operator simply inverts the carton, and glass containers are then fed—via an

It's the Nash!

The ability of Nash Compressors to maintain original performance over long periods is no accident. Nash Compressors have but a single moving element, the Nash Rotor. This rotor is precision balanced for long bearing life, and it revolves in the pump casing without metallic contact. Internal lubrication, frequent cause of gas contamination, is not employed in a Nash. Yet, these simple pumps maintain 75 lbs. pressure in a single stage, and afford capacities to 6 million cu. ft. per day in a single compact structure.

Nash Compressors have no valves, gears, pistons, sliding vanes or other enemies of long life. Compression is secured by an entirely different principle of operation, which offers important advantages often the answer to gas handling problems difficult with ordinary equipment.

Nash Compressors are compact and save space. They run without vibration, and compression is without pulsation. Because there are no internal wearing parts, maintenance is low. Service is assured by a nation-wide network of Engineering Service offices. Write for bulletins now.

No internal wearing parts.

No valves, pistons, or vanes.

No internal lubrication.

Low maintenance cost.

Saves floor space.

Desired delivery temperature Automatically maintained.

Slugs of liquid entering pump will do no harm.

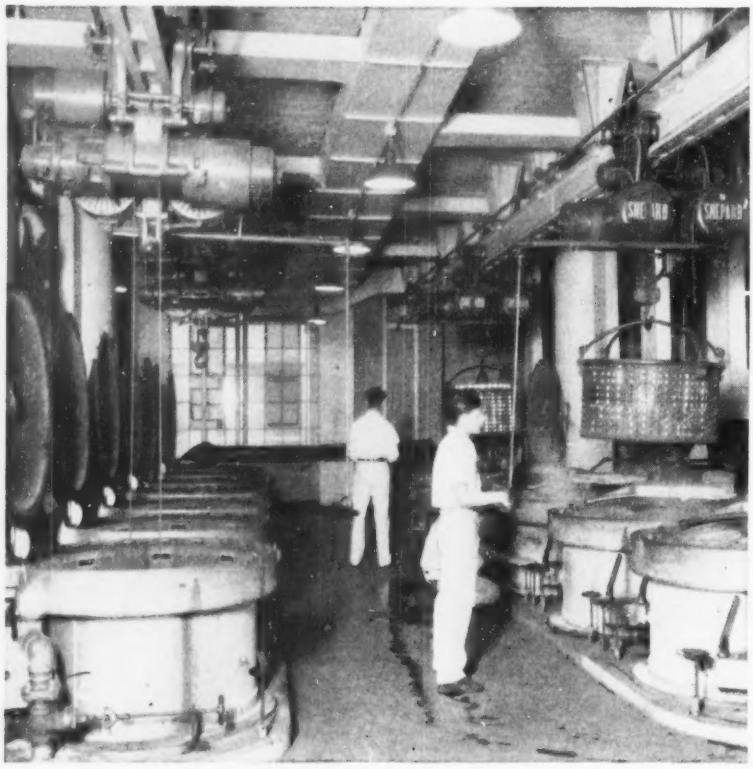
75 pounds in a single stage.

NASH ENGINEERING COMPANY

312 WILSON, SO. NORWALK, CONN.

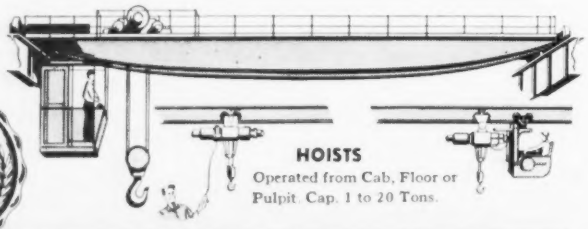
SHEPARD NILES

adds "Wings" to your work-in-process



HERE'S THE THRIFTY WAY to handle materials—because it uses only a minimum of manpower. Pick up the load with a Shepard Niles Hoist, then deposit it where you want it. There's no unnecessary handling, no wasted floor space. Instead, you make room for more production or storage.

IT'S NOT ONLY LESS COSTLY, it's faster and easier when you handle it through the air. But which hoist will suit your plant best? The Shepard Niles representative can give you this answer, based on a careful study of your plant's needs. Send for Bulletins — ask to have a representative call.



50th ANNIVERSARY SHEPARD NILES CRANE & HOIST CORP. 1903-1953

HOISTS
Operated from Cab, Floor or Pulpit. Cap. 1 to 20 Tons.

SHEPARD NILES
CRANE AND HOIST CORPORATION

1234-SCHUYLER AVENUE, MONTOUR FALLS, N.Y.

accumulating table—into process line.

Jar-free cartons are placed on a wheel gravity convevor directly above the accumulating table, and a packer positions them for loading with filled and labeled product coming from the partitioned-off filling room.

A steel chute drops the filled carton from packing-table level to a knee-high powered convevor running along the wall past the six stations. The cartons are then carried through sealers and printers on the way to storage or shipment.

Since it is now common practice to receive glass jars from suppliers in unprinted cartons, the convevorized system permits carton storage and handling with a minimum of segregation. One or more products using the same style of glass container can draw from a common bank of containers and the cartons can then be printed and identified right on the convevor line by use of a sealing machine.

Cartons that do not require printing, however, can bypass this operation over a roller gravity hinged section that is easily swung into position. The two lines then converge and feed a roller gravity spiral convevor that takes the finished cartons to floor level for palletizing.

The three unique double-tier spiral descending convevors—each one serving two filling lines—permit pallet building at two unloading points. They save considerable floor space and insure positive delivery of cartons.

End (Resume reading on page 63)

Sprays Zip Cleaning

—Continued from page 53

that appears impractical by slow manual methods, then there's a place for the spray technique. You can cover up to 12,000 sq. ft. in 30 min. With it you can spray about 2 gal. of cleaning solution a minute, working a distance of 50 ft. around the unit without moving it . . . then simply wheel it to the next area and go right on cleaning without changing connections—wide coverage with minimum effort.

Tank Trucks and Cars, Too

Let's turn now to another type of spray cleaning equipment that is producing very satisfactory results in the dairy industry. This is a rotary unit similar to a lawn sprayer in action. It operates at high pressure, projecting hot cleaning solution from a series of nozzles so positioned that the sprays overlap. The unit, therefore, is capable of cleaning any enclosed area,

such as tank trucks, tank cars, and processing and holding tanks of all kinds.

The rotary does such a thorough job of covering the tank surface that a dilute solution of specialized detergent applied through it removes heavy milk and casein deposits with no hand brushing at all. An ordinary steel drum may act as the supply tank. Solution is heated by steam line and circulated via a suitable pump or Sellers unit.

Cleaning of milk tank trucks had always been a hand washing job, thus was unpopular with the clean-up crew. Also, the cramped quarters made for haphazard cleaning, with resulting build-up of milkstone. On top of this, there was excessive use of water, steam, and particularly washing compound.

In contract, the accompanying table shows savings derived through use of the rotary unit.

Special Rail-Car Unit

Cleaning of railroad tank cars (or barges) used in transportation of edible oils, chemicals, etc., is also time-consuming, expensive work when hand methods are used. A specially designed detergent-spraying apparatus is now available that will automatically clean such car interiors. The unit discharges a hot solution of detergent at 100 lb. pressure. It eliminates hand brushing, scraping, and steaming out. Cost records of edible oil processing organizations indicate that the unit cuts cleaning costs up to 50 percent.

It's clamped in the dome of the car so that nozzles and tubular frame extend into the interior. Hot detergent, as well as hot rinse water, are delivered through the tube to the nozzles under high pressure. The unique horizontal and vertical directional feature makes sure that the high-pressure-sprayed solution cleans all fouled interior surfaces without any manual cleaning operation. And the cleaning action, which is instantaneous, proceeds while the men usually assigned to this task go about other duties.

End (Resume reading on page 54)

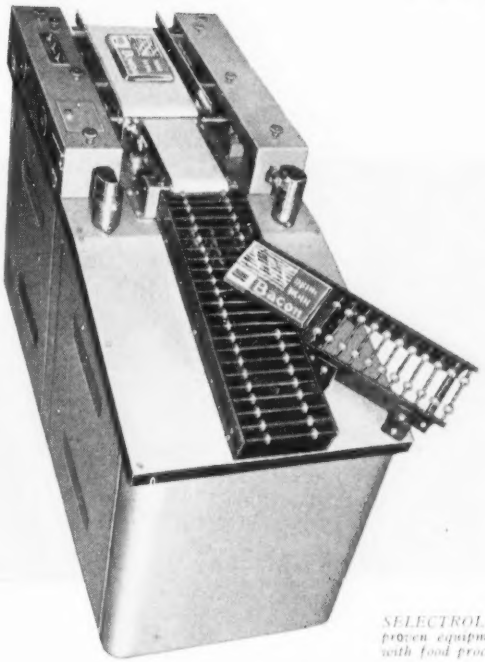
$250,000 Sterilizer

—*Continued from page 51*

Dielectric heat is generated between the electrodes by resistance of bags. This heat penetrates through the bales to raise the temperature uniformly to 220-240 deg. F. by the time the bale clears the last sterilizing station. Bag strength is not impaired by the treatment.

THERE IS NO SUBSTITUTE FOR EXACT WEIGHT

How to Improve Pre-Packaging Profits . . . .



SELECTROL Model 1200-S is proven equipment already in use with food processors and packers.

Manual weighing of every consumer size food package on your production lines adds substantial cost to the individual package cost.

Automatic, accurate, high speed weighing of every package is a proven and positive method of decreasing your packaging costs.

The SELECTROL Model 1200-S is designed for food processors to weigh, classify and sort broad pre-packaged food products into separate weight channels. Overweights and underweights are rejected from your conveyor line . . . only the exact weight units flow on to your overwrapping and sealing operation.

The SELECTROL in your production line will:

- Save manual weighing time and labor
- Save food in overweight packages
- Speed production
- Prevent distribution of shortweights
- Count and record every package
- Signal your filling machine operator for control changes when required

Learn the details in automatic weighing for food products generally. Write today!

EXACT WEIGHT SCALES

BETTER QUALITY CONTROL
BETTER COST CONTROL

THE EXACT WEIGHT SCALE COMPANY
910 W. Fifth Ave., Columbus 8, Ohio
2920 Bloor St., W., Toronto 18, Canada

For more information, use coupon on page 201.

CHEMISEAL Gaskets and Packing

PROTECT FOOD QUALITY

SPEED PRODUCTION

REDUCE MAINTENANCE COSTS

MADE OF TEFLON

TEFLON'S Inertness to All Food Acids, Alkalis and Solvents — its Extreme Anti-hesiveness—its Zero Water Absorption—Make it the Ideal Gasket and Packing Material for Corrosion, Contamination and Sanitation Problems Throughout the Food Industry

CHEMISEAL TEFLON-JACKETED GASKETS are available in any size, with a variety of filler materials suitable for glass, glass-lined, porcelain-lined and metal piping and equipment. These fillers are protected on both faces and the inside diameter by the inert Teflon* Jacket. Ask for Catalog No. 1-339 WA.

CHEMISEAL SNAP-ON GASKETS are molded to match contour of conical-end glass pipe. They assure perfect automatic centering of joints and free flow of materials. Made for all standard pipe sizes from ¼ in. to 6 in. Ask for Catalog No. 820.

CHEMISEAL V-TYPE PACKING is the ideal valve packing that seals with low gland pressures and operating torque. Extremely resilient, tough and anti-hesive—it will not seize the valve stem or shaft even when handling the most difficult solutions. Supplied in sets with square end adapters. Send for Catalog No. 810-V.

CHEMISEAL PUMP PACKING is extremely effective for rotating and reciprocating shafts. Provides a low friction 2-way seal that not only prevents axial seepage, but also seals against shaft and stuffing box as well. Supplied in sets to meet specific requirements. Ask for Catalog No. 711.

*du Pont trademark

UNITED STATES GASKET COMPANY

FLUOROCARBON PRODUCTS DIVISION
CAMDEN 1, NEW JERSEY

Representatives in Principal Cities Throughout the World

At each end of the three sterilizing areas within the unit, heat is generated in the two 64-ft.-long, 150-kw. ovens to which a 10,000v. current at 14 megacycles is delivered. Assured is the final sterilizing temperature of 220-240.

Bales do not exit from the short-wave heater at this high temperature. Cooling is accomplished throughout the travel beyond the last station by circulation of air from blowers.

During 16 hr. of operation, the unit completely sterilizes plant requirements of 60,000 bags.

Operation is automatic, except at the loading feed conveyor—where due to the belt's slow travel only intermittent attention is required.

Safety Accented

No recognized safety precaution has been overlooked. Electrodes are located far inside the unit, well beyond careless human reach. Machine operation is also protected, with safety controls compensating in case of overload, overheat, or mechanical difficulties.

When the chemical method was relied on for bag sterilization, hazard of poison gas was ever present. Labor requirements for handling were much greater than now required—so also the demands on floor area.

However, greatest drawback of the chemical method was lack of complete assurance that sterilization was 100 percent effective.

Today's actual cost of sure and complete sterilization, is approximately ⅛th less than with the former, less-efficient chemical method. And due to the savings in operating costs, it is estimated the capital investment may be amortized in between 8 and 10 years.

Finally, it is to be noted that feed bags are not the only containers which may be affected by bacteria and harmful microorganisms. Paper bags are likewise to be considered as a source of contamination (see "Pinning Down Bag-Borne Bacteria," FE Jan. p. 57). Also, contamination may be transmitted from cartons and wrappers.

Accordingly, in working toward the optimum in quality control, the door is open to possibilities of using this advanced sterilizing procedure on many types of packages and packaging materials.

In addition, experiments are now being conducted at Eastern States to determine whether microorganisms responsible for vegetation diseases can be killed in bags of grain or seeds by dielectric heat without destroying the life of the germ.

End (*Resume reading on page 52*)

Useful Books
Government & Publications

Processing Confectionery

A Text Book on Candy Making. *By Alfred E. Leighton. Published by Manufacturing Confectioner Publishing Co., 418 N. Austin Blvd., Oak Park, Ill., 1952. 180 pages; 6x9 in., cloth. Price $6.*

According to the author, purposes of this book are "to satisfy a recognized need and start a would-be candymaker on the path of understanding." Slanted toward the beginner or those interested in learning more about confectionery processing, the volume covers elementary principles of the trade and does not pretend to be a detailed scientific analysis.

All major facets of candymaking are clearly presented, including sugar and sugar boiling, hard candies, fondant and fondant making, wafers, patties, creams, fudges, caramels, and aerated items such as marshmallows, nougats, jellies and gums, centers for dipping, chocolate dipping, and confectionery adjuncts.

The author is a leading food and candy technologist. Book is indexed.

Vest Pocket Manual

Glossary of Terms Used in Methods, Time Study and Wage Incentives. *Edited by The Management Research & Development Div., The Society for Advancement of Management, 411 Fifth Ave., New York 16, 1952. 32 pages; 4x9 in., paper. Price $1.*

Published in a handy vest-pocket format, booklet contains 332 terms and definitions relating to cost accounting, time study, wage planning and administration, arbitration, methods engineering, sales planning, and personal practices.

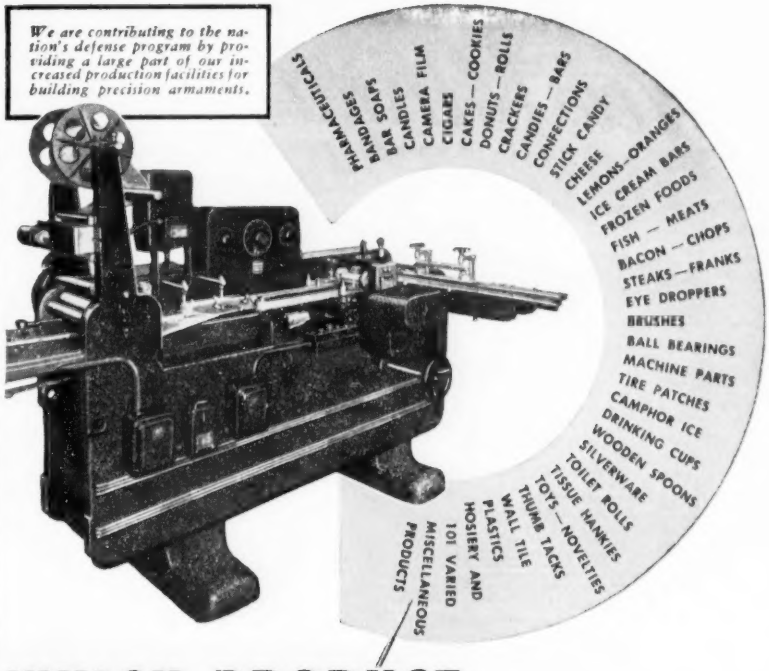
Ninety-three management leaders are stated to have spent four years compiling this glossary. It is designed as an authentic reference for both management and unions.

Industrial Problems Treated

Materials Handling. *By John R. Immer. Published by McGraw-Hill Publishing Co., Inc. 330 W. 42nd St., New York 36, 1953. 591 pages; 6¼x9¼ in., cloth. Price $8.00.*

Materials handling, one of the most important determinants of modern production, is covered with all its

We are contributing to the nation's defense program by providing a large part of our increased production facilities for building precision armaments.



WHICH PRODUCT . . .

would you like to package

?

BETTER CHEAPER FASTER...

at Speeds of 3 Units per Second!

Solid or fragile — regular or irregular shapes — single or multiple products per unit. It makes no difference to the automatic, continuous feed, high speed operation of the Campbell Wrapper. You achieve important savings in labor and materials, too. Automatic feeds, in many cases, permit *one* person to tend several machines — And, boards or stiffeners need *only* be used if desired! Machine wraps all modern packaging materials and films with equal ease, accurately positions pre-printed identifications and provides a full range of wrapper closures . . . crimped, flared, folded . . . glue or hermetical sealing. Send us a sample of your product for a detailed report on how the Campbell Wrapper can improve and *speed up* your packaging.

New York office 55 West 42nd St.

Write for illustrated brochure.

Campbell WRAPPER

HUDSON-SHARP MACHINE CO. • GREEN BAY, WIS.

Manufacturers of Aniline and Gravure Presses, Folders, Interfolders, Laminators, Wexers, Embossers, Slitters, Sheeters, Roll Winders, Packaging Machines, Crepers and Tissue Converting Units.

For more information, use coupon on page 20.

New MIKRO
AIR CONVEYING SYSTEM
Ventilates and Cools as it Carries Sugar, Flour and other Foodstuffs to the MIKRO-COLLECTOR*
PULVERIZER, DRYER, MIXER, BLENDER, ETC.
MIKRO-COLLECTOR
Diagram showing installation for conveying material from dryer (or other equipment) to drum packers, cooling it during conveying from 220°F. to 120°F.

- *Permits use of ventilated air from packaging hoods to be used for conveying material*
- *Reduces required size of dust collecting unit as much as 50%*
- *Conveys material from any source (dryer, pulverizer blender, tank, vat, etc.)*
- *Cools the conveyed material without mechanical refrigeration*
- *Spans distances up to 200 feet*
- *Will by-pass any obstacle in the form of existing machinery or equipment*

These and other advantages make the MIKRO Air Conveying System an ideal low-pressure, low-cost method of conveying material from any dust source. Its complete flexibility helps solve plant layout problems without costly flow sheet revisions.

This dust-tight installation conveys up to 300 grains of dust per cubic feet of air . . . Makes possible the return of filtered air to processing area, thus reducing loss of heated or conditioned air . . . Assures freedom from infestation and metallic contamination . . . Easily cleaned . . . Eliminates booster fan, thus preventing change in particle sizing.

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problems, applications, developments, and equipment in this book. Not designed for students but primarily for engineers who have expressed need for a functional textbook, volume presents cost, managerial, and organizational aspects of the subject.

Field problems, surveys, and accounting studies of materials handling are dealt with in separate chapters. There are also sections on operator training, maintenance, and safety.

Indexed, book offers complete bibliography and list of pertinent films.

Author is professor of industrial management and assistant director of business studies, American University.

Two Useful Pamphlets

SANITATION STANDARD FOR PAN WASHERS, RACK WASHERS, UTENSIL WASHERS, AND INDUSTRIAL SINKS. *Edited and published by the Baking Industry Sanitation Standards Committee, 511 Fifth Ave., New York 17. 1953. 12 pages; 6x9 in., paper. Price 25c.*

Primary objective of the committee editing this booklet is the development of fundamental standards for the design, construction, and installation of bakery machinery and equipment.

One of the first of a series, this publication sets forth uniform application of principles of sanitary design for bakery equipment.

SAUSAGE AND CHOPPED MEATS. *Compiled and published by Koch Supplies, 2520 Holmes St., Kansas City 8, Mo. 1953. 40 pages; 5½x8¾ in., paper. Price 50c.*

To answer the many requests for information regarding the making of sausage, the Koch company has compiled an interesting booklet which describes sausage classifications, sausage machinery, meats, casings, seasonings and salt, and binders.

Fifteen pages are devoted to basic formulas. Also described are a number of common complaints and what can be done to rectify them.

The book is being published simultaneously in England and this country, being distributed abroad by Dowson & Mason Gas Plant Co., Ltd., Manchester, England.

Dealing With Employees

PSYCHOLOGY OF INDUSTRIAL RELATIONS. *By C. H. Lawshe. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York 36. 1953. 350 pages; 6¼x9¼ in., cloth. Price $5.50.*

Specifically written for managers, industrial supervisors, and others

whose course of study has not encompassed psychology, this book offers valuable detailed data on dealing with personnel and employee problems.

Though presented in nontechnical terms, volume remains true to latest accepted principles in technical field. Indexed and giving a complete bibliography, it offers valuable information to those in positions of authority.

In compiling this work the author had the assistance of E. J. McCormick, associate professor of psychology, Purdue University; A. J. Drucker, AGO, Department of the Army; Edmond E. Dudek, U.S. Naval personnel research unit; Wm F. Long, Lackland Air Force Base; Kenneth Oliver, Creole Petroleum Corp.; and Robert I. Dawson, U.S. Rubber Co.

Government Publications

SUBSISTENCE. *Federal Supply Catalog, Department of Defense Section, Group 89, Feb.* 1953. 43 pages. 25c. First in a series of single catalogs for use by all Military Services. Lists all food items (1,131) which may be stocked, purchased, and issued.

ANIMAL AND VEGETABLE FATS AND OILS, 1951. *Bureau of the Census, Facts for Industry Series: M17-1-01,* 87 pages, 40c. Compares annual data on production, consumption, stocks, and foreign trade in fats and oils, with 1950 and 1949 data.

These recently issued documents are available, at the prices indicated, from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. When no price is indicated, the pamphlet is free and should be ordered directly from the Bureau responsible for its issue.

MACARONI AND NOODLE PRODUCTS, MARCH 1953. *Federal Security Agency, F&DA., Washington, D. C.* Definitions and standards of identity for alimentary pastes (macaroni and noodle products).

MILK PRODUCTION ON FARMS AND STATISTICS OF DAIRY PLANT PRODUCTS, 1952. *Bureau of Agricultural Economics, Feb.* 1953. 46 pages. A statistical summary of calendar year 1952 data.

OPERATING COSTS OF 15 COOPERATIVE POULTRY DRESSING PLANTS. *Farm Credit Administration Bulletin 70, USDA.* 73 pages. 25c. Covers procurement and presentation of cost data in a 1947-1948 study in eight eastern States.

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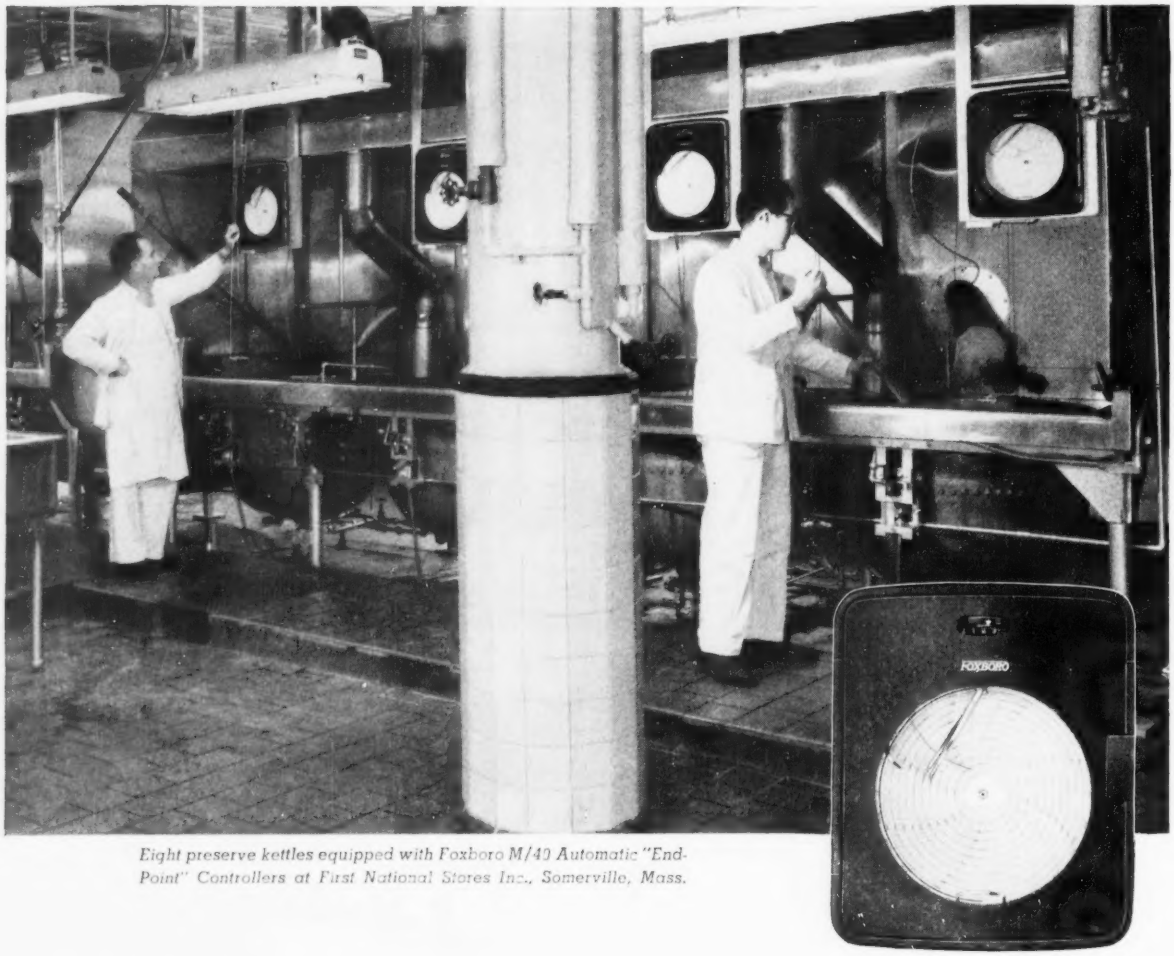

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Bread-Softener Ban

FDA will immediately enforce a provision of the bread standards against use of the chemical bread softener polyoxyethylene monostearate, said Commissioner Charles W. Crawford on May 13.

His statement followed action by the 8th Circuit Court of Appeals, St. Louis, vacating a previously ordered stay against enforcement of the ban. The Court, however, agreed to hear an appeal by Research Products Corp.

Commissioner Crawford declared that vacating of the ban cleared the way for FDA moves to eliminate the chemical as an ingredient in standardized varieties of bread "until its fitness and safety have been shown."

Speeds Cheese Making

Cheddar cheese manufacturers are seen halving processing time by employing a new method just developed by BDI. New procedure is said to take less than 3½ hr. from time starter is added until curd is pressed, as against approximately 7½ hr. now required.

Cited is elimination of much hand labor. Also some of the usual practices in producing acid, cooking, cheddaring, and salting are dropped or changed. Method can be put into operation with slight additions to present facilities.

Details will be made available as soon as public-service patents are granted.

MSG From Molasses

Conversion to monosodium glutamate of residual liquids (molasses) from beet sugar extraction processes, will be launched by Great Western Sugar Co. in a $25 million plant at Johnstown, Colo. Success of pilot-plant ventures since 1943 guided the company in deciding on the new venture.

Better Pecans Coming

A new pecan variety that comes into production early and yields a moderately heavy crop of thin-shuck nuts has been developed at U. S. Pecan Field Station, Brownwood, Tex. The nuts shell satisfactorily, and kernels are said to retain their good qualities longer than most varieties.

Tech Advances, Exhibits, and Honors In Forefront at IFT Boston Meet

Spotlight is on latest food field scientific strides and industrial advances as the curtain goes up, June 21, on the 13th annual meeting of the Institute of Food Technologists in Boston's Statler Hotel.

On the program, running to June 25, are a full slate of 16 pertinent technical sessions (see box p. 230), a comprehensive industry exposition with some 50 exhibitors (floor plan and participants on p. 111), awards to outstanding field leaders, and exemplary plant trips in "The Hub" area.

As pointedly put by IFT President Bernard E. Proctor, stress is on "making America's foods more nutritious, more flavorful, safer, more attractive, and more convenient to use, and toward making the production of such foods more efficient through research and technological advancement."

In cardinal interludes of the program, signal honors will go to an enterprising food company and three foremost technologists:

FOOD ENGINEERING AWARD: To Geo. A. Hormel Co. for its advanced hog-killing techniques; presentation of plaque at Awards Luncheon, 12:15 P.M., Monday, June 22, Ballroom Assembly (special article on p. 43).

INSTITUTE'S FIRST ANNUAL CITATION: To Samuel Cate Prescott, Massachusetts Institute of Technology; presentation at General Session, 11:45 A.M. Monday, June 22, Ballroom.

This special honor hails Dr. Prescott for his vital contributions toward founding and developing the Institute as well as for his salient work as scientist and international authority in food technology. Particularly noted are his pioneer efforts in bacteriological control which promoted practical methods of food preservation and sterilization in the canning field. Cited, too is his outstanding work in dehydration, quick freezing, dairy and fishery techniques, fruit plant research, and coffee chemistry. Dr. Prescott is a past winner of both the Nicholas Appert Medal (1943) and the Stephen M. Babcock Award (1951).

NICHOLAS APPERT MEDAL: To Victor Conquest, vice-president in charge of Research & Development, Armour and Company; presentation at Award Banquet, 7:00 P.M., Tuesday, June 23, Ballroom.

Conferred for fostering improvements in foods and making possible new foods, the Medal honors Mr. Conquest for devoting his entire career to such significant developments—10 yr. as a production control technologist and the remaining 27 as an administrator activating these projects. His guidance in developing quality dried eggs for the Armed Forces and sugar-free eggs is specially noted among highlights of his work.

Mr. Conquest will present the Award Address at a General Session on Wednesday, June 24 (11:20 A.M., Ballroom).

STEPHEN BABCOCK AWARD: To Charles N. Frey; presentation at the Awards Luncheon, 12:15 P.M.,

Samuel Cate Prescott
1st Annual IFT Citation

Charles N. Frey
Stephen Babcock Award

Victor Conquest
Nicholas Appert Medal

IFT's 16-Section Tech Program

Summary of technical program, Institute of Food Technologists, Annual Meeting, Hotel Statler, Boston, June 21-25, 1953, follows:

Monday, June 22

10:00 A.M.—General Session, Ballroom
2:00 P.M.—Sec. A, Dietary Problems of an Aging Population, Ballroom
2:00 P.M.—Sec. B, Meat Products, Research Papers, Rooms 406-8
2:00 P.M.—Sec. C, Vegetable Products, Research Papers, Room 419

Tuesday, June 23

9:00 A.M.—Sec. D, Quality Control, Research Papers, Rooms 406-8
9:00 A.M.—Sec. E, Fish Processing, Bay State Room
9:00 A.M.—Sec. F, Chemicals in Foods, Ballroom
9:00 A.M.—Sec. G, Fermented Products, Room 419
2:00 P.M.—Sec. H, Fruit Products, Research Papers, Rooms 406-8
2:00 P.M.—Sec. I, Miscellaneous, Research Papers, Room 419
2:00 P.M.—Sec. J, Fish Processing, Ballroom

Wednesday, June 24

9:00 A.M.—Sec. K, Microbiology, Research Papers, Room 419
9:00 A.M.—Sec. L, Canning & Processing, Ballroom
9:00 A.M.—Sec. M, Packaging Problems, Bay State Room
9:00 A.M.—Sec. N, Fruit & Vegetable Research, Rooms 406-8
11:20 A.M.—General Session, Nicholas Appert Address, Ballroom
2:00 P.M.—Sec. O, Canning & Processing, Ballroom
2:00 P.M.—Sec. P, Fruit & Vegetable Research, Rooms 406-8

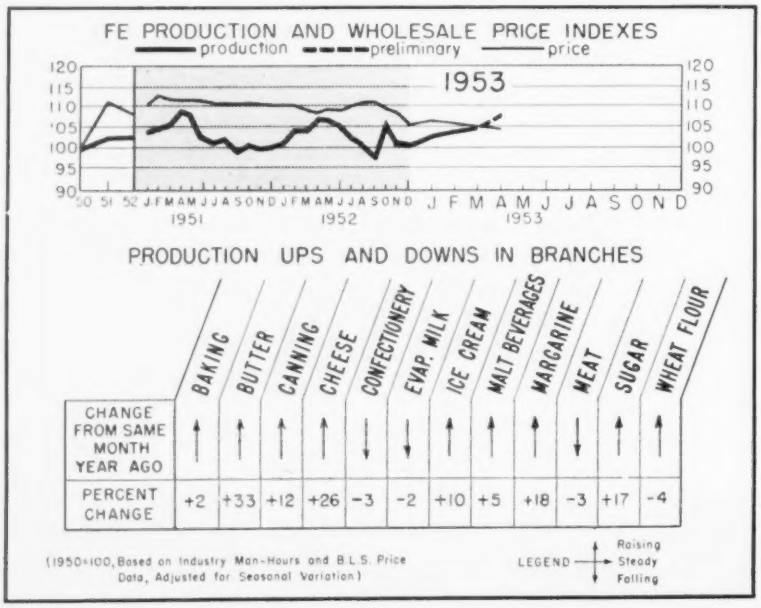
Monday, June 22, Ballroom Assembly.

Symbolized in the conferring of this "progress-ideals-responsibilities" honor are Dr. Frey's "long and distinguished career in food science with recognition of his zeal in promoting nutritional and other forms of biological research and following it through to technological application." Cited are his unstinting endeavors in publication of articles, his inventions and patents, and his untiring efforts in the professional societies. And special note is made of his broad work in biochemical lines, with marked reference to vitamin research.

Doubling "Poly" by '55

Completion of plans for a huge polyethylene expansion program—designed to double U.S. production by 1955—is announced by Bakelite Co., Division of Union Carbide & Carbon Corp. The 3-year project calls for construction of three new plants to bring the company's total annual output of "poly" to over 250,000,000 lb.

First plant will begin operation this August at Texas City, Tex. By mid-1954, the Seadrift, Tex., plant will open. And by early '55, the Torrance, Calif., facility is slated for action.



Package Costs Weighed At AMA Convention

Better packaging keyed to reduce costs got top billing at American Management Assn.'s National Packaging Conference. Highlights:

▶ *On Mechanized Packaging*—Many hand-performed operations hobble progress, reported E. A. Lindquist, National Biscuit Co. He called them expensive, inefficient and wasteful.

Change from 3,500-biscuits-per-min. reel ovens to 10,600-per-min. band ovens required more efficient packaging. And this led to Nabisco's complete elimination of hand-packing of crackers into cartons.

▶ *New Package Design*—Redesign of packages for complete lines of products, giving them family resemblance and reducing costs, was endorsed by L. L. Duke, Mead Johnson & Co. Package standardization and interdepartmental cooperation has enabled this firm to order larger quantities of materials to cover a long period. On some items, costs were cut 67%.

▶ *Cutting Distribution Costs*—Alert packaging can do more to cut high distribution costs than any other single factor, declared W. S. Driskill, McCormick & Co. Such costs can absorb half the consumer's dollar. Attention to population shifts, shopping hours, and one-stop self-service shopping has enabled supermarkets to cut such costs to 16-18 percent. And need for the "selling" package is evident.

▶ *Right Package*—Packaging for consumer sales will change more rapidly in the next few years than in the past few, predicted E. A. Miller, Jewel Tea Co. Consumers often find small packages more convenient. Good shelf-appearance is wanted by retailers. At present, soft colors are popular. Color contrasts must be maintained so that packages are readable.

Very significant is design for ease in handling—for cost of stocking shelves with dry groceries, according to a Jewel survey, was 40 percent of the cost of handling the item. And price-marking another 20 percent.

▶ *Tailormade Sheets*—All basic packaging films have valuable properties, but each has drawbacks making it difficult to handle or deficient in some functional property, C. M. Woodcock, General Foods Corp., pointed out. Combinations of film with paper bases constitute a major trend in the packaging field. They enable packagers to take advantage of films without need of replacing packaging equipment. Because of their paper surface, paper-plastic sheets can be handled on most packaging machines.

▶ *Better Filling*—Ideal place to plug profit leaks is at the filling machine,

Canned Goods Climb 500%

Forest of canned foods—788 items in all—represents typical lot now consumed by average family each year, reports American Can Co. Jump from 130 average of 1901 is credited to new convenience, quality, economy, and variety of goods.

said E. P. Lee, General Foods Corp.

To operate filler at maximum accuracy and capacity, consistent with maintenance costs, container damage, and changeover time, Mr. Lee suggested: (1) Selecting equipment best suited to the need, (2) establishing indexes for performance, and (3) controlling product as well as working to curb.

At a high-speed package-filling panel, W. P. Schommer, General Mills, Inc., said that weights must be checked every 2 min. for some products. But easy-to-fill packages require checking only four times daily.

Hors d'Oeurves

▶ USDA has developed an electronic color sorter for eggs. There really is no difference in quality between white and brown eggs. Trouble is customers don't know it—and the customer is always right.

▶ **Using the radioactive-carbon technique, a Columbia U. geologist found that still-edible bison meat from Alaska was 28,000 years old. And most folks think the deep-freeze is a recent invention.**

▶ In 1914 it took 572 hr. of work to fill a market basket. In 1952, only 309 hr. Just toss this in to ease the pain when a $20 bill slides through your fingers at a supermarket.

▶ **Most women don't heat the water hot enough when they make tea, observes an expert. Is he saying that American women don't know how to boil water?**

▶ Canada Dry's quinine water, Quinac, doubled in consumption last summer. Seems the "gin and tonic" mixer also is a sales tonic.

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from 65 to 45 Min.

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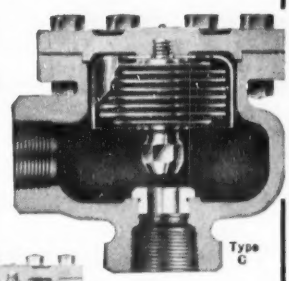
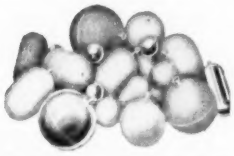
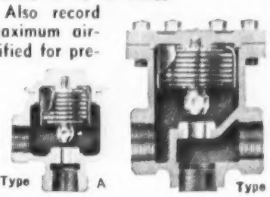
Records of a recent installation of Nicholson steam traps, by a large processor, show they cut cooking time 30%; e.g., one operation was shortened from 65 to 45 min. Nicholson units keep equipment full of live steam because: 1) they operate on lowest temperature differential: 2) have 2 to 6 times average drainage capacity. Also record low for steam waste; and maximum air-venting capacity. Widely specified for preventing damage to thin gauges; eliminate cold blow in unit heaters.







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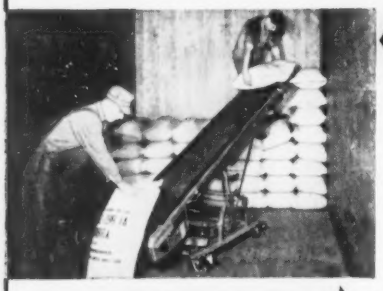

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Grain Sanitation Program Undergoing Alterations

Modifications of the grain sanitation program, announced by FDA to begin on July 1, have been necessitated by poor condition of some of the wheat held by Commodity Credit Corp. of USDA. Equivalent of 25 percent of the 1952 crop of wheat is in control of CCC, and because of insect and rodent contamination, much of the held wheat does not pass the sanitation criteria established by FDA for the more stringent enforcement program.

Test methods proposed by FDA were criticized at a Senate Agriculture Committee hearing in March. Modifications in the program were consequently announced, but continued criticism occasioned still further recession by FDA.

At this writing, the names of men on the committee of 15 announced by the joint statement of USDA and USDHEW on May 1 had not yet been released. It was to include 2 representatives from each Department, 4 from land-grant colleges in the principal wheat-growing areas, 5 from the grain handling and processing industries, and 2 nutritionists or sanitary experts.

This committee will cooperate in developing a plan to promote "improvement in the harvesting, storage, transportation, and processing of grain". The two departments believe that "the plan will more rapidly advance the interests of the consuming public".

Vegetable Fats in Butter Spotted New Fast Way

Quick method for detecting vegetable fats in butter, developed at Cornell University, may be the long awaited answer to the dairy product adulteration problem now confronting regulatory officials.

Method is based on the fact that vegetable fats contain appreciable quantities of gamma and delta tocopherols, whereas the alpha form is predominant in butter. A minimum of equipment is needed.

Test involves rinsing an ether solution of the fat with acid and alkali, followed by color development with a diazonium salt. Presence of appreciable quantities of gamma or delta tocopherols is indicated by a pink to red color.

Preliminary results indicate the method may be useful in detection of vegetable fats in other dairy products, such as ice cream, since the fat can be separated from frozen products

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that stays WHITE!
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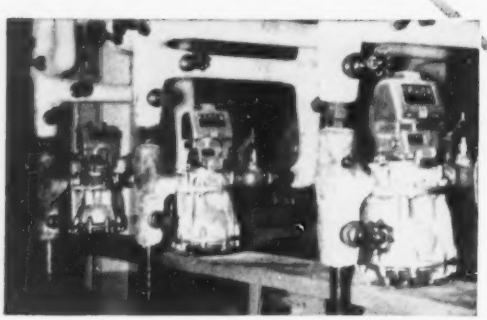

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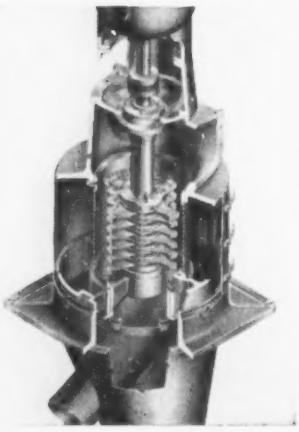

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A new concept in the crushing of grapes; whole grape clusters, including grapes and stems, are passed through an RDI-18 stainless steel fitted Rietz Disintegrator with 150 HP and equipped with a stainless steel Rietz Prebreaker Feeder. 100 tons of grapes per hour are handled by the Rietz Disintegrator under normal operating conditions. This Disintegrator has replaced all the crushing equipment formerly used. This operation results in a considerable reduction of cost while yielding a clearer and better juice with increased yields of wine and alcohol.

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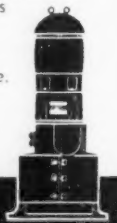

Equipment for the food and chemical process industries

Rietz MANUFACTURING CO.
Santa Rosa, California

without appreciable loss of tocopherols when using a modification of the BDI detergent test for butterfat.

Developer was Dr. W. F. Shipe, Dept. of Dairy Industry, Cornell, working with the N. Y. State Joint Legislative Committee on Imitation Milk Products.

On "Synthetic" Front

California legislature's failure to pass a bill banning sale of imitation ice cream has put dairymen on the spot because of the present law that prohibits imitation frozen products from being made in dairy plants.

To add to their headaches, Pictsweet Corp., statewide distributor of frozen foods, has constructed a plant especially to manufacture the imitation product. Immediate distribution through some 3,000 markets is planned.

In Alabama, the attorney general has ruled against sale of oleo-type ice cream "containing fats other than milk fats."

And in Canada, the Institute of Edible Oil Foods is carrying full-page newspaper ads protesting proposed legislation in Ontario that would ban such use of vegetable fats and oils.

Briefly . . .

● **ACCIDENTS: Pabst, Milwaukee reports cutting its '52 accident-frequency rate fully 54.5 percent under '51.**

● WHALE STEAKS: Electric harpoons, developed by GE, Ltd., are replacing explosive type on British whalers. New weapon kills animals in minutes instead of hours, thus is seen affording fresher whale steaks.

● **YOUR DEBTS: Food manufacturers are large bank borrowers—but mostly seasonal, and the net increase has been modest. So says McGraw-Hill Dept. of Economics in its recent check for industrial debt dangers.**

● PEANUTS: Support programs pricing peanuts off the market were assailed by William F. Olsen, Curtiss Candy Co., Chicago, at the recent National Peanut Conference in Washington, D. C. On growth control, he decried fact that fewer acres were harvested in '52 (1,513,000) than in any year since '35.

● **NUTRITION: New facilities for nutritional studies are being set up in the Maritime Regional Laboratory, Halifax, N. S.**

● FREEZER PLANS: Progress of freezer food plans is being hobbled by failure of banks to give credit support on reorders of food by participants. This is contention of John Bess, maker of Freshmaster freezers and founder of FOA Marketers, Inc.

FDA Food Standards

Ice cream standard briefs may be filed until Aug. 3, an extension from the May 5 filing date originally announced. Order extending time was published on p. 2593 of the May 2 *Federal Register*.

Margarine standard appeal in the 2nd Circuit Court (arguments on its merits) was scheduled for May 14 following a postponement from April. This case was initiated by Richard S. Reade of New York City, who seeks rejection of the standard's provision for synthetic vitamin A and provitamin A.

Legislation: Bill to simplify food standardization proceedings was introduced by Representative Hale (R., Me.) on May 7, as predicted last month (FE May, p. 204). Wording of the new bill, H. R. 5055, differs somewhat from the text originally proposed by Mr. Markel, but without change of substance. The bill has been referred to the House Committee on Interstate Foreign Commerce, but no hearing date has been set.

Senate bill (S. 1542), companion to that of Rep. Miller in the House (H. R. 4277) calling for a "Pesticide Residue Amendment" (FE May, p. 204) was introduced by Sen. Aiken (R., Vt.) on Apr. 1. And second of the series of three Miller bills (H. R. 4901), seeking "regulation of chemical additives in food to insure that such chemical additives have been adequately pre-tested and declared safe," was introduced Apr. 28.

Hobby and FDA: Secretary Ovetta C. Hobby in her first press conference referred to a number of policy-making positions which she may fill in the Department of Health, Education & Welfare. The FDA Commissioner is not one of those named. However, Mrs. Hobby said that "we are reviewing other confidential and policy-making positions. After that review is completed, these position descriptions will be submitted to the Civil Service Commission for a determination". Questioned, she added "no one has asked for his (Commissioner Crawford's) job or made any complaint.

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● Nuts are spread in a single layer on a Cyclone Flat Wire Conveyor Belt that carries them under a battery of vacuum throats. Here lightweight, shrunken, or nuts otherwise unsuitable for further processing, are picked up and discarded. This new method is faster and more accurate than hand sorting . . . production costs are reduced . . . product quality is improved.
In almost every food plant there is some operation that could be speeded up by the use of a Cyclone Metal Conveyor Belt. Perhaps one of Cyclone's belt types would benefit your plant operations, too. Get in touch with the nearest Sales Office for free advice and write Dept. H-63 for Catalog 84.
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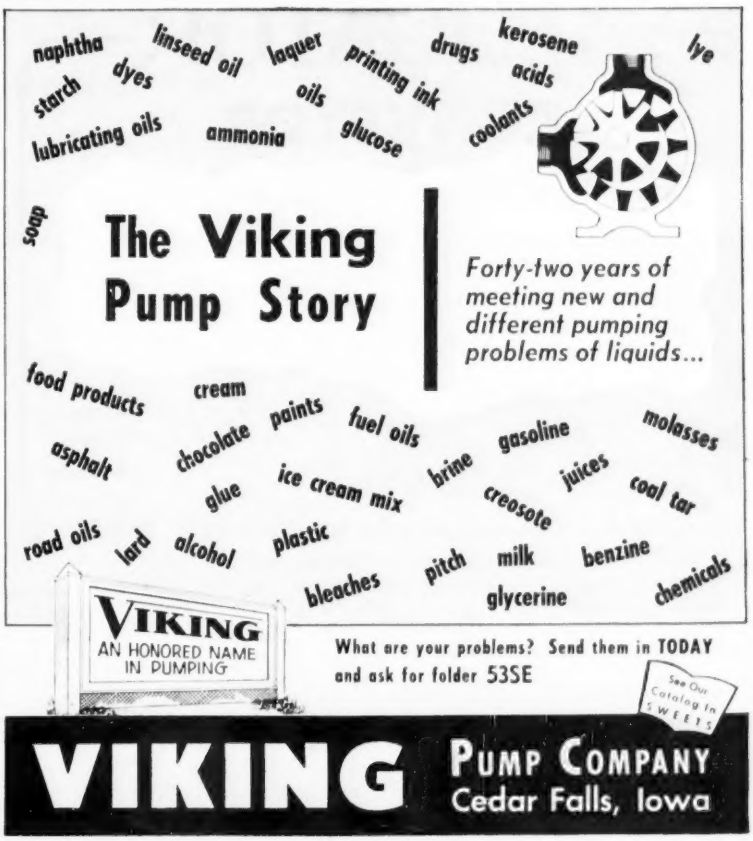
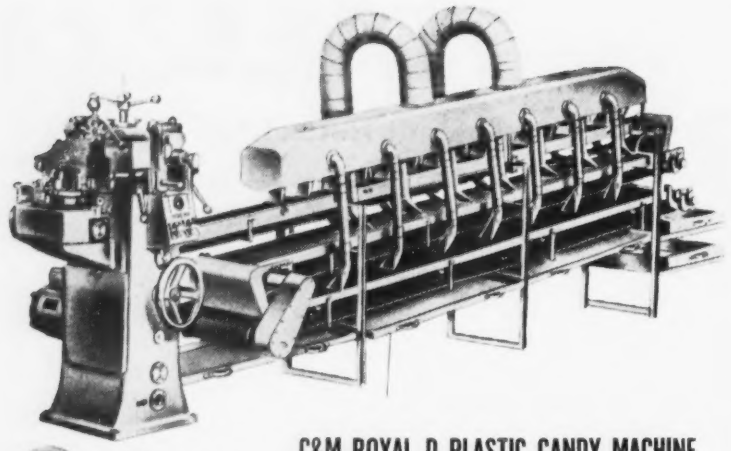


For more information, use coupon on page 201.



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Now, with one machine, the C&M Royal D, you can produce both ordinary plastic candies with a high percentage of filling, formed in chains, and unfilled hard candies, cut separately, without joints or seams. This versatility makes the C&M Royal D perfect for any size factory.

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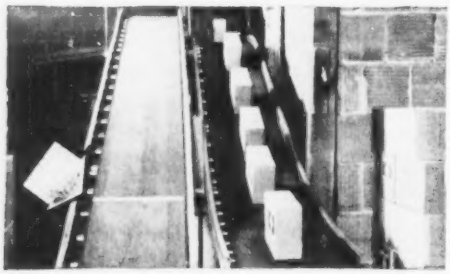

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FLEXIBLE STEEL LACING CO., 4646 Lexington St., Chicago 44, Ill.

JUST A HAMMER TO APPLY IT

Up until this time we have made no request that the job be taken out of Civil Service".

Sea Food Checks: Revised regulations covering FDA inspection of *processed shrimp* and *canned oysters* were published on p. 2128 of the Apr. 16 *Federal Register* (a correction was also published on p. 2375 of the Apr. 23 *Federal Register*). The order rescinds former sections 155.0 to 155.13 dealing with canned shrimp, sections 155.16 to 155.29 dealing with fresh and frozen shrimp, and sections 155.30 to 155.43 dealing with canned oysters.

Coumarin Withdrawn

Coumarin producers voluntarily decided to withdraw that flavoring agent from the market, according to a late-May announcement of F&DA.

Recent research raised a question as to the safety of coumarin, F&DA reported. But no cases of illness have been traced to it.

USDA Grade Standards

Recent actions by Production & Marketing Administration, USDA, on U. S. Grade Standards and related activities include following:

Canned sweet cherries, third revision, p. 2073, Apr. 14 *Federal Register*, effective May 14.

Poultry and edible products, reduction of required minimum number of containers comprising grading sample, p. 2076, Apr. 14 *Federal Register*, effective May 14.

Frozen lima beans, sixth revision, proposed, p. 2150, Apr. 16 *Federal Register*, written comments received until May 16.

Dry peas, split peas, and lentils, revised, proposed, informal hearing scheduled for May 8, Spokane, Wash. Effective Aug. 1, if adopted; written comments received until June 1.

Canned lima beans, fourth revision, proposed, p. 2236, Apr. 18 *Federal Register*, written comments received until May 18.

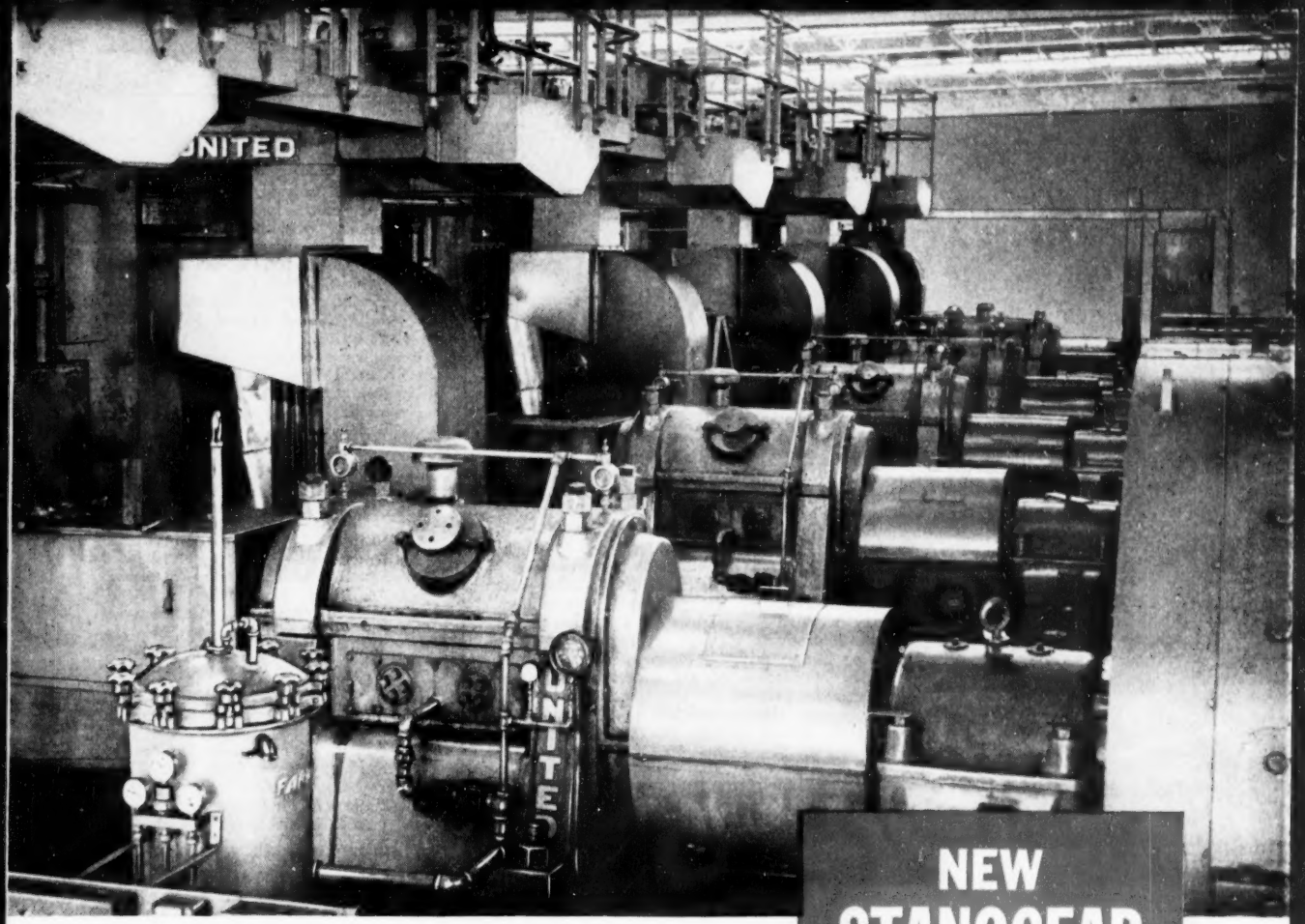
Tomato catsup, third revision, proposed, p. 2415, Apr. 24 *Federal Register*, written comments received until May 24.

Canned apples, third revision, proposed, p. 2503, Apr. 29 *Federal Register*, written comments received until May 29.

Canned cream style corn, fourth revision, proposed, p. 2590, May 2 *Federal Register*, written comments received until June 1.

Fresh shelled lima beans for processing, revised, p. 2635, May 7 *Federal Register*, effective June 6.

Canned fruit cocktail, revised, pro-



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NOW . . . 7 ways better for extreme-pressure lubrication . . .

New and improved STANOGEAR Compounds have been developed to meet the requirements of an increasing variety of tougher extreme-pressure lubricating jobs found throughout industry, today. The result of several years of special research and field test work, these outstanding products have proved in actual service their ability to provide these important advantages:

1. Higher load carrying capacity. Use of improved extreme-pressure additives in STANOGEAR Compounds provide a greater anti-weld property. This results in the higher load carrying capacity which these products have demonstrated in actual service.

2. Superior retention of load carrying capacity. In service tests, STANOGEAR Compounds have proved superior to conventional extreme-pressure lubricants in ability to maintain a high load carrying capacity over extended periods of service.

3. Freedom from objectionable deposits. Appropriate base stocks and additives give STANOGEAR Compounds a high resistance to oxidation, thus minimize the formation of deposits.

4. Excellent storage stability. STANOGEAR Compounds contain compounding ingredients which assure excellent stability both in service and storage.

5. Good water separation. STANOGEAR Compounds have demonstrated their superiority to ordinary extreme-pressure lubricants in ability to provide good water separation.

6. Anti-foaming. Under adverse operating conditions, the anti-foam agent in STANOGEAR Compounds has prevented foaming troubles.

7. Versatility. A unique combination of additives in STANOGEAR Compounds equips these products for various industrial gear applications where extreme-pressure lubricating properties are necessary. To meet varying viscosity requirements, STANOGEAR Compounds are available in eight viscosity grades.

The Standard lubrication specialist in your area of the Midwest will be glad to give you more information about the new STANOGEAR Compounds. You need only phone your local Standard Oil office. Or write: Standard Oil Co., 910 South Michigan Avenue, Chicago 80, Illinois

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FLEXIBLE STEEL
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...faster, better
processing with
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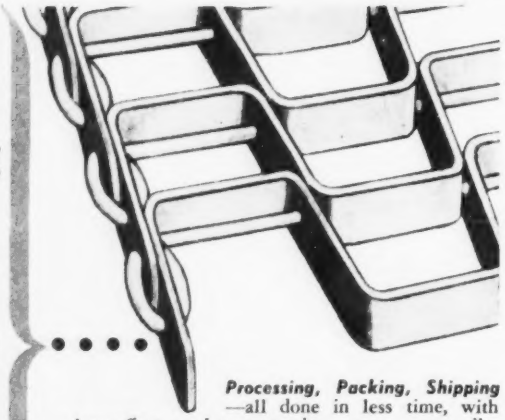

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LaPorte's Flexible Steel construction prevents *creeping, weaving* or *jumping,* by providing a tighter grip on the friction drum. This also assures a perfectly flat surface for containers, empty or filled . . . results in a smooth, steady flow of products through every process from loading bin to shipper. Open mesh feature also permits circulation of air and liquids around products in process — simplifies cleaning and sterilization. Highly resistant to heat and cold. Available in any length, practically any width.

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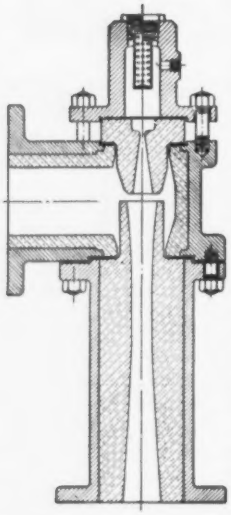

The chemical industries are employing more and more Croll-Reynolds Evactors in vacuum processes where corrosion resistance is a major consideration. These steam jet vacuum units provide pressures ranging from a few inches to a few microns. Croll-Reynolds is a pioneer in the use of new construction materials and our engineers are investigating corrosion problems continually.

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Consult our engineers for high vacuum equipment carefully designed for your specific conditions, and constructed of materials selected for your particular conditions.

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Schedule of Events

June

14–16—National American Wholesale Grocers' Assn. mid-year meeting; Chicago.
14–18—National Confectioners Assn. annual convention, and (16-18) Confectionery Industries Exposition; Waldorf-Astoria Hotel, New York City.
15–19—Exposition of Basic Materials for Industry; Grand Central Palace, New York City.
19–30—International Dairy Machinery Fair, Utrecht, Holland.
21–25—Institute of Food Technologists annual meeting and FE Award; Hotel Statler, Boston.
22–24—American Dairy Science Assn. annual convention; U. of Wis., Madison.
22–24—Grocery Mfrs. of America; Greenbrier, White Sulphur Springs, W. Va.
22–26—2nd. International Congress on Food Distribution; Ostend Kursaal, Ostend, Belgium.
22–26—13th International Dairy Conference, The Hague, Netherlands.
23–25—National Macaroni Manufacturers Assn.; Hotel Broadmoor, Colorado Springs, Colo.
29–J1—National Dairy Council annual Summer conference; Edgewater Beach Hotel, Chicago.

July

9–10—National Kraut Packers Assn. annual meeting; Catawba Cliffs Beach Club, Port Clinton, Ohio.
16–17—National Pickle Packers Assn. Summer meeting; Drake Hotel, Chicago.
27–31—American Oil Chemists' Society edible oil short course; Texas A&M College, College Station, Tex.

August

10–13—International Apple Assn. annual meeting; Chicago.
24–26—Canadian Institute of Sanitary Inspectors Dominion Convention; Vancouver, B.C.

posed, p. 2650, May 7 *Federal Register*, written comments received until June 6.

Nonfat dry milk solids, roller process test method revised, p. 2663, May 8 *Federal Register*, effective May 4.

Chili sauce, new, proposed, p. 2714, May 9 *Federal Register*, written comments received until June.

—*End*—

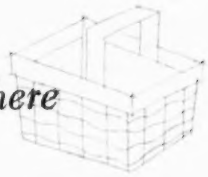
Progress in Bronze

—*Continued from page 43*

study, and a fair quota of trial and error—the perfected award-winning process emerged.

Handling 1,100 hogs an hour, the method puts the hogs into a gentle "sleep" on a continuous gas-tunnel conveyor belt which is at the right height for easy shackling (FE, Oct. '52, pp. 90-92.) Mechanisms which force the animals onto the conveyor and CO_2 control equipment are part of the operation.

This process is going places. It



Here's where *Ritchie packaging pays off!*

Yes, in the store! Where products compete for customers' attention—that's where good packaging, *Ritchie packaging pays off!* It pays off, too, wherever sales-appealing packaging appears in the prospect's view: on a TV screen, in an advertisement—and *always* on the dealer's shelf.

For years, Ritchie has put this sales-appeal into packaging for many of the John Sexton & Co. line of products. And Ritchie can help *you*. Broadest packaging line in the business, expert designers—*every* facility for planning, designing, for making folding cartons and displays, transparent packages, set-up boxes, fibre cans, paper spools.

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Plant Safety Engineers

Here's How YOU can Prevent Production Losses Caused by Dermatitis . . .

Reduce Medical Costs and Improve Industrial Relations

Dermatitis actually wastes *more* man hours and medical treatment dollars than the more sensational industrial "accidents".* Furthermore, dermatitis cases cause revulsion, not only among afflicted employees, but their co-workers as well.

You can prevent these distasteful situations by providing the *proper* protective garments and *insisting* that personnel in your plant always wear them when in contact with irritating substances.

Gloves are especially important in reducing dermatitis cases and your production managers will thank you for choosing the *right* gloves for each job. Comfortable fit, hand freedom and long wear pay off in employee good will, increased production and lowered operating costs.

PIONEER liquid-tight Stanzoil® gloves, made of oil and acid resistant non-allergic DuPont milled neoprene, are reducing hand dermatitis hazards in hundreds of plants all over the world. 32 safety styles, weights, size and colors . . . PIONEER catalog shows you *at a glance* how to choose the most efficient and economical glove for the job.

Don't risk costly time out — write for complete information today.

**Occupational Hazards, December, 1952*

Industrial Products Division

The PIONEER Rubber Company

242 Tiffin Road • Willard, Ohio

Quality Gloves for 35 Years

will work on cattle and sheep, as well as on hogs. It is being tried experimentally on turkeys and chickens. And the meat industry is showing great interest in it.

At Hormel, it has produced outstanding results. Only about 40 percent as much labor is now required for shackling, releasing workers for pleasanter duties. A back-breaking, dirty, undesirable job has been converted into an easy one—so easy that women can do it in neat uniforms. This, incidentally, is a highly significant improvement. Meat packers face a real problem of making work easier and more desirable.

Economy also comes from better bleeding and higher blood recovery. Too, inferior production is appreciably reduced—fewer bloody trimmings and no stuck shoulders.

Yes, Hormel has made important contribution to the industry—one which is now available to others.

Previous Winners

In winning the 1953 FE Award, Hormel joins this roster of previous distinguished winners:

1951—Andersen's Foods, Inc., for aseptic canning of pea soup.

1949—Florida Citrus Canners Cooperative, for its frozen concentrated juice process.

1947—Atlantic Coast Fisheries Co., for its continuous fish filleting.

Acknowledgments

FOOD ENGINEERING wishes to thank the 26 outstanding technologists (FE, Nov. '52, p. 204) on the Award Committee, and particularly Dr. Samuel Cate Prescott, chairman. This Committee expertly evaluated the many excellent processes entered in the competition and selected the most outstanding.

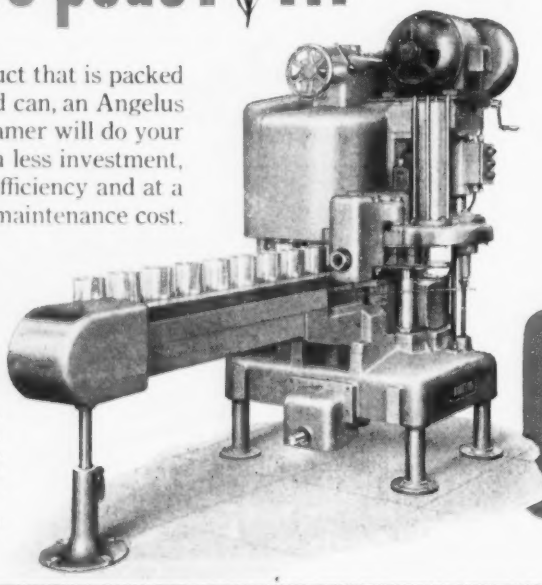
FE also thanks those who submitted information on their processes for the Committee's consideration. All the processes were rated highly. And though only one could win, the participation of the others contributed to better appreciation of the achievements and importance of food technology.

Credit is due, too, to the Institute of Food Technologists—whose president appoints the Award Committee and at whose annual meeting the Award is presented. Hormel will receive the 1953 Award at the Boston IFT meeting on June 22, at the Awards Luncheon.

End (*Resume reading on page 44*)

from petroleum to peas. . . .

For any product that is packed in a round can, an Angelus Automatic Seamer will do your job with less investment, maximum efficiency and at a lower maintenance cost.



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Recent Inventions

PRODUCTS

Dietetic Food Product Prepared With 0.02-1.3 Percent Solution of Sodium Cyclamate Alone or With Added Soluble Saccharin—*J. B. Gordon, Burlingame, Calif.* No. 2,629,665. Feb. 24, 1953.

Food Product Consisting of Box-Shaped Shell With Edible Filler That Can be Projected Upward by Bottom Pressure in its Non-Edible Container—*J. H. Lipshutz, Brooklyn, N. Y.* No. 2,630,389. March 3, 1953.

Nut Product Encased in Film of Edible Calcium Low-Methoxyl Pectonate and Calcium Pectate With Integrated Alkylated Hyroxyanisole and Ethylene Diamine Tetra Acetic Acid Components—*J. C. Miers, Concord, and H. S. Owens, Berkeley, Calif. to USA* No. 2,631,938. Mar. 17, 1953.

PROCESSES

Continuous Countercurrent Extraction of Ground Roasted Coffee Employing Elongated Passageway With Internally Moving Beans and Counterflow Hot Water—*B. B. Fogler, Lexington, and J. B. Nugent, Winthrop, Mass. to Arthur D. Little, Inc., Cambridge.* No. 2,629,663. Feb. 24, 1953.

Treating Oil-Bearing Seed and Nut Meats Prior to Extraction by Raising Moisture Content Subjecting to Short Cook—*J. W. Dunning, Lakewood, Ohio to The V. D. Anderson Co., Cleveland.* No. 2,629,722. Feb. 24, 1953.

Dry, Undevitalized Wheat Gluten With Acetic Acid Solubility of 70-75 Percent Made by Subjecting Fine Wet Product to Hot Air Until Moisture Content is Below 7 Percent—*R. L. Slotter, Peoria, Ill. and J. A. Delap, Bartlesville, Okla. to USA.* No. 2,631,379. Mar. 17, 1953.

Centrifugally Separating Yeast Cells or Other Impurities From Beer in Closed System With Periodic Countercurrent Pressure Flushing of Centrifuge—*T. V. Hanno, Stora Essingen, Sweden, to Aktiebolaget Separator, Stockholm.* No. 2,631,777. Mar. 17, 1953.

Roasting Coffee in Sealed-In Chamber Utilizing External Directly Communicating Heating Flame and Introducing Moisture During Roast—*R. L. Montgomery, Jr., Bala-Cynwyd, Pa. to Wm. Montgomery Co., Philadelphia.* No. 2,632,706. Mar. 24, 1953.

Preparing Comminuted Dehydrated Dough Sponge by Dividing Moist Dough in Pellets, Initially Drying to Form Crust, Then Drying to Below 7 Percent Moisture Content, Comminuting—*D. A. Battiste, Philadelphia.* No. 2,632,707. Mar. 24, 1953.

Continuous Process for Cooking Foodstuffs Comprising Steam Heated Tank With Built-In Enclosed Screw-Type Continuous Precooker Which Discharges Into Lower Part of Tank for Final Cook While Under Motivation—*E. Allen, Spencerport, N. Y. to Allen Iron & Welding Works, Inc., Rochester.* No. 2,633,073. Mar. 31, 1953.

Hulling, Washing, and Drying Grain, With Simultaneous Screening—*A. C. Daman, to Mining Process & Patent Co., Denver, Colo.* No. 2,633,171. Mar. 31, 1953.

EQUIPMENT

Doughnut Former Consisting of Elongated Bored Tube and Hole Forming Mandrel With Plurality of Belts—*E. J. Roth, Rockleigh, N. J. to Joe Lowe Corp., New York.* No. 2,628,578. Feb. 17, 1953.

Unit for Storing, Shipping and Dispensing Liquid Baby Food—*J. J. Horan, Detroit, Mich.* No. 2,628,908-13. Feb. 17, 1953.

Apparatus for Uncasing Glass Jars From Cartons Employing Battery of Gripping Devices Integrated With Conveyor and Case Moving Equipment—*H. T. Griswold, San Francisco to Owens Illinois Glass Co., Maumee, Ohio.* No. 2,628,732. Feb. 17, 1953.

Food Freezing Apparatus With Multiple Refrigerated Channels and Continuous Conveyor—*J. C. Olsen, Campbell, and T. A. Dungan, Los Angeles, Calif. to Food Machinery & Chemical Corp., San Jose.* No. 2,629,233. Feb. 24, 1953.

Apparatus for Adding Cure to Belly of Bacon Under Vacuum—*R. C. Graves, Washington, D. C.* No. 2,629,311. Feb. 24, 1953.

Horizontal Pressure Cooker With Inner Rotating Shell for Circular Agitation of Lid-Clamped Retort Baskets—*H. C. Davis, Diablo, Calif. to Walnut Creek Canning Co., Walnut Creek, Calif.* No. 2,629,312. Feb. 24, 1953.

Pretzel Forming and Depositing Machine—*H. G. Allen, Niagara Falls and O. M. Hudson, Kenmore, N. Y. to American Machine & Foundry Corp.* No. 2,629,340. Feb. 24, 1953.

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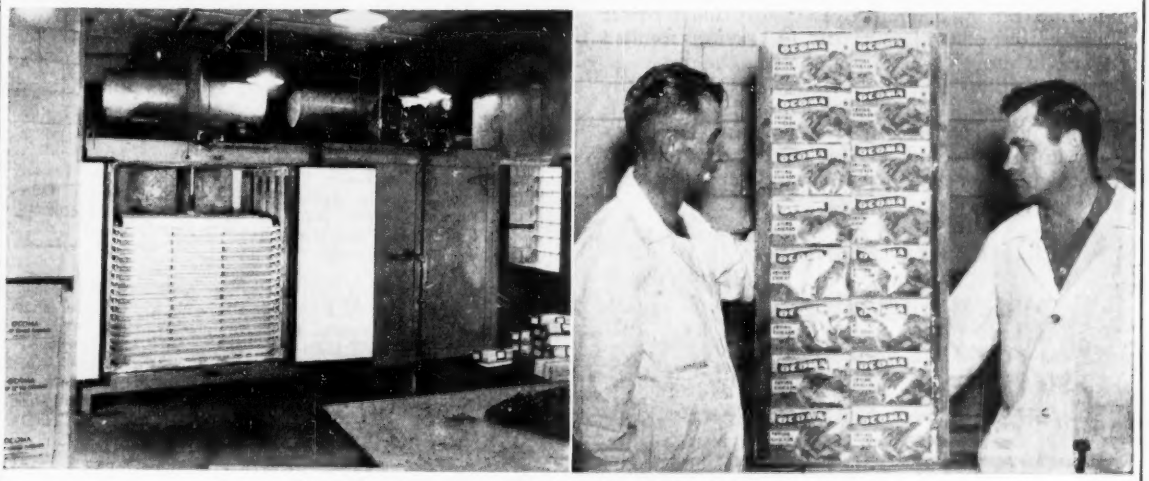
AMERIO Double Contact Pressure Plate Freezers (U. S. Pat. No. 2,608,069)

for Your Consumer and Institutional Frozen Food Packages

YOU GET SUPERIOR FLAVOR—CONSISTENT UNIFORMITY—ECONOMY



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Designed For Ammonia, Brine or Freon Refrigerant

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and discovered he had saved
$$ THOUSANDS through:

1. INCREASED PLANT CAPACITY
2. BETTER QUALITY
3. FUEL SAVINGS

"We never realized how much could be obtained with a mere improvement in steam trapping. It's like a man with dirty eye-glasses—he thinks he's seeing perfectly until he cleans them and finds out how much he has missed.

"We installed 71 Armstrong traps (one on each steam consuming unit) at a cost of about $550. The greater heat in all units showed up in a big production increase and improved quality due to better temperature control. Of course, fuel savings resulted from the more efficient use of steam."

He's* enthusiastic about ARMSTRONG'S. Why not? He found he revitalized his whole plant. It won't hurt to check your own eye-glasses. If there's any doubt, it could pay big dividends to talk it over with your nearby Armstrong Representative.

*name on request

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ARMSTRONG STEAM TRAPS

Apparatus for Dividing Strips of Dough Into Loaves Employing Rotating Pinching and Dividing Wheel Over Conveyor—*C. D. Rice, Kalamazoo, Mich.* No. 2,629,341. Feb. 24, 1953.

Ice Cream Sandwich Making Machine Employing Cake and Brick Ice Cream Feed Chutes Over Timed Moving Conveyor and Horizontal Cutting Blade—*J. H. Keyser, Kenova, and V. C. Currey, Huntington, W. Va.* No. 2,629,342. Feb. 24, 1953.

Boxed Candy Brushing Mechanism—*I. B. Rose, Dayton, Ohio to Stephen F. Whitman & Son, Inc., Philadelphia.* No. 2,629,343. Feb. 24, 1953.

Fruit Splitter and Pitter Employing Plurality of Vertically Disposed Supporting Blades and Reciprocating Vertical Splitting Blade—*T. M. Harrer, Oakland, to Fruit Machinery Co., Berkeley, Calif.* No. 2,629,417. Feb. 24, 1953.

Bulk Conveying and Egg Handling Machine—*R. C. Sneed, Piedmont, and C. S. Jordan, Glendale, Calif. to Safeway Stores, Inc., Oakland.* No. 2,629,479. Feb. 24, 1953.

Nonagitating Can Handling Apparatus Employing Magnetic Means to Retain Cans In Transit Through Processing Chamber—*W. De Back to Food Machinery & Chemical Corp., San Jose, Calif.* No. 2,629,482. Feb. 24, 1953.

Sugar Syrup Mixing and Honeycomb Filling Machine Employing Parallel Longitudinal Pipes With Spaced Holes Supplied by Pressure-Tight Fluid Pumping System—*M. J. Taylor, Richmond, Va.* No. 2,629,885. March 3, 1953.

Fish Advancing Means Employing Trough and Resiliently Guided Pusher—*N. L. Oates to Smith Cannery Machines Co., Seattle, Wash.* No. 2,630,208. March 3, 1953.

Machine for Sizing Cored Fruit by Maximum Transverse Diameter of Their Core Axes—*E. M. Wayland, Covesville, Va.* No. 2,630,222. March 3, 1953.

Apparatus for Sizing Rolling Fruit Employing Converging Inclined-Plane Parallel Conveyor Belts—*W. O. Kinnebrew, Winter Haven, Fla.* No. 2,630,224. March 3, 1953.

Cheese Making Apparatus Comprising Two Floor-Supported Kettles With Dual Overhead-Driven Adjustable Coupled Agitators—*C. F. Krucker, Darlington, Wis.* No. 2,630,303. March 3, 1953.

Apparatus for Drying Hops Employing Enclosed Chamber and Forced Hot Air-Gas Circulation System—*V. A. Bloxham, Berkeley, Calif.* No. 2,630,311. March 3, 1953.

Machine for Untwisting Link Sausage and Stripping Casing Comprising Rotating Gripping and Slitting Head—*V. A. Grey, Chicago to Voss Brothers Mfg. Co., Davenport, Ia.* No. 2,630,598. March 10, 1953.

Apparatus for Removing Membrane or Skin From Animal Stomachs Employing Pair of Oppositely Rotating Rollers With Spiral Intermeshing Ribs—*A. Grant and K. Tomlinson, Chicago.* No. 2,630,599. March 10, 1953.

Milk Flow Metering Device Employing Volumetric Measuring Chamber With Non-Impeded Float-Actuating Device—*W. H. Harstick, Oak Park, and H. W. Hein, Chicago Ill. to International Harvester Co., New Jersey.* No. 2,630,712. March 10, 1953.

Want more information on any of these recent patents? If so, you may obtain detailed printed copies by writing direct to the U. S. Patent Office, Washington, D. C., giving serial numbers of those you want and enclosing 25c for each copy.

Apparatus for Processing Ripe Olives Consisting of Conical Shaped Tank With Means for Air-Activating Submerged Olives—*R. N. Ball, and E. Van Dellen, Visalia, Calif.* No. 2,630,749. March 10, 1953.

Juice Extractor Comprising Rotating Fruit-Cupping Turrets Serving Fruit Cutter at Their Outlet Bight, and Second Pair of Turrets Carrying Reamers—*L. F. Williams, Anaheim, Calif.* No. 2,630,849. March 10, 1953.

PACKAGING

Box Sealing Apparatus Employing Elongated Transversely Spaced Electrodes Supplied by Radio Frequency Current to Create Sealing Current Between Electrode Gap—*R. R. Richardson and O. W. Cov, Chicago, W. T. Ritter, River Forest, R. O. Ragen, Oak Park to Chicago Carton Co., Chicago.* No. 2,631,642. Mar. 17, 1953.

Tin Can Construction With Spaced Protuberances Formed in Cylinder Which Act as Fulcrums for Severed Top or Bottom—*J. C. Casey, San Francisco, Calif.* No. 2,631,753. Mar. 17, 1953.

Filler Apparatus With Elongated Discharge Spout Having Plurality of Branches to Fill Single Line of Moving Containers Positioned Underneath—*W. McK. Martin, San Mateo, and A. E. Post, San Francisco to James Dole Engineering Co., Redwood City, Calif.* No. 2,631,768. Mar. 17, 1953.

Container Filling Machine With Container-To-Nozzle Elevating Mechanism That Will Stop Machine When Incompletely Elevated—*A. C. Everett, Brighton, Mass. to Pneumatic Scale Corp., Ltd., Quincy, Mass.* No. 2,631,769. Mar. 17, 1953.

This may amaze you!

...and it will surely *help* you: FOOD ENGINEERING's most important issue in 25 years!

The engineering progress of the food industry has been rapid, as you know from reading FOOD ENGINEERING. But, when the whole story is pulled together in one place . . . when it is sifted and analyzed and summed up . . . it is an *amazing* story! It is almost *too* big a series of advances for any one person to have kept up with in the past 25 years.

Your eyes will be opened wide by the profit-boosting, cost-cutting possibilities you may have missed in the past . . . by the future possibilities *you can't afford to miss* . . . as you read *'Twenty-Eight to 'Seventy-Eight.*

That's the special report you asked for in our poll of 4,200 food plants last year. You voted 12-to-1 for that special theme for FOOD ENGINEERING's 25th Anniversary issue. You're going to get it . . . in October.

Starting with 1928—the year FE was founded—our editors will show you the important advances in each unit operation listed at right. Then, on the basis of today's soundest trends, they will project these advances into the next 25 years.

You'll want to keep the October issue and refer to it time and again, in checking *your* plant operations against the most up-to-date . . . in planning *your* Food Plant of the Future.

'TWENTY-EIGHT to 'SEVENTY-EIGHT

Partial List of Subjects

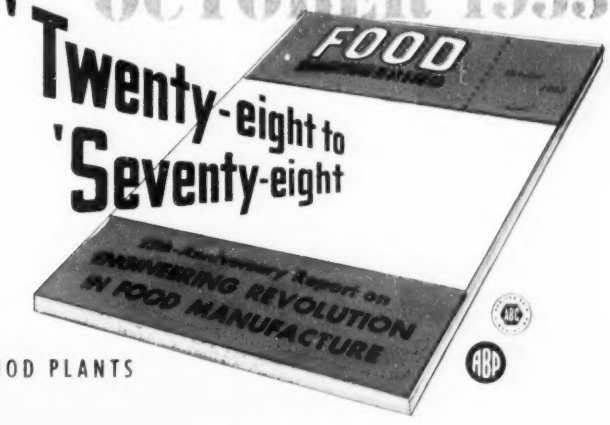
Cleaning Raw Materials
Separating
Disintegrating
Proportioning
Mixing
Forming
Coating
Heat Transfer
Moisture Removal
Packaging Mtls. & Equip't.
Waste Disposal
Materials Handling
Air-Conditioning
Automatic Process Control
Quality Control
Sanitation

Economics of Technical Progress — A special section devoted to economic and business factors in food-industry progress; how equipment must pay for itself; how modernization funds are raised; etc.

Special Features on the Future — "The Food Plant of the Future"; The Future of Cold Sterilization (electronic, nucleonic, antibiotic); The Future of Ultrasonics.

All this and more in FE's October issue—

OCTOBER 1953



FOOD ENGINEERING

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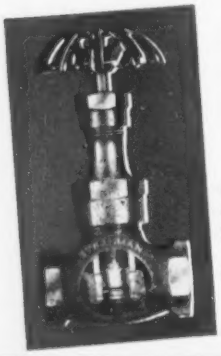
MIXING UNIT and HOSE STATION
For Hot and Cold Water
or Steam and Cold Water

Different clean-up operations in the Dairy and Food Processing industries require wash-up water of different but constant temperatures. Too often this is accomplished by the operator "feeling" the wash water. The Strahman Temperature-Indicating Unit eliminates this "by feel" method of judging the proper temperature.

A blending chamber at the discharge point of the unit, completely mixes the elements passed through, so that at a glance, the easily read gauge gives the operator the exact temperature of his wash water.

Strahman Temperature-Indicating Mixing Units and Hose Stations are furnished for use with steam and cold water, or hot and cold water. They may be had plain or in chrome plated finish.



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on All Mixing Units
Demanded by Dairymen because:
No wire drawing or discs to crack.
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Men & Companies

Dr. Robert G. Tischer, former food technology professor at Iowa State College, has been named director of food laboratories for Quartermaster Food & Container Institute. Dr. Tischer has also been director of quality control with John Inglis' Frozen Foods.

Industry

Airline Food Corp.'s entire stock has been purchased by company's new president, Joe G. Wick, and his associates.

American Maize Products Co. has appointed two directors: Earle E. Langeland and James B. Melick.

American Sugar Refining Co. has named Joseph F. Abbott board chairman and H. Beach Carpenter as president.

Armour and Co. will process poultry at a new plant in Morgan Hill, near San Jose, Calif., beginning next month.

Altes Brewing Co. of Detroit has halted operations at its San Diego, Calif., plant and is liquidating stocks.

Castle & Cooke Ltd., Hawaiian firm with large sugar and pineapple interests, has named Fred Simpich, Jr., and Malcolm McNaughton as vice-presidents.

Dr. Pepper Co. is consolidating plans for opening of new $300,000 St. Louis plant.

General Foods has named Clifford R. Spiller as general manager of **Walter Baker Chocolate & Cocoa** division, Frederick J. Otterbein to head **Birds Eye** division, Leon A. Miller as new president and general manager of **General Foods Ltd.**, and Charles W. Rehor to manage **Franklin Baker** division.

Griggs, Cooper & Co., Chicago food manufacturer, has merged with **Consolidated Grocer's Corp.** of Chicago.

Italian-Swiss Colony wine holdings have been sold to Petri family of San Francisco.

Katz Food Products Co. has occupied new modern food plant in Pittsburgh as part of continuing expansion program.

Morton Salt Co. has announced plans for institution of new research and development organization to expand research in salt products and processes.

National Biscuit Co. will construct a $10,000,000 cracker bakery in northeast Philadelphia.

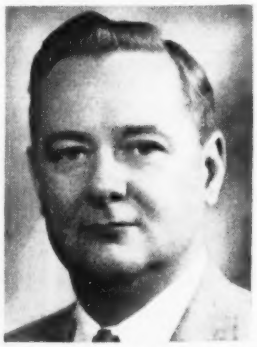
C. J. Neuman Coffee Co. is reported to have merged with **Albert Ehlers, Inc.**

Pillsbury Mills, Inc., has elected James L. Rankin president and R. J. Keith a director.

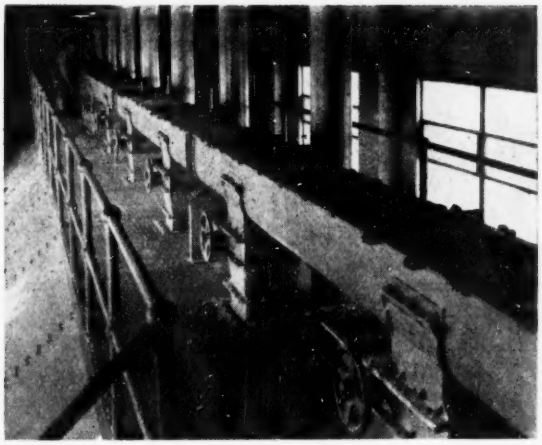
Swift & Co. has named three new vice-presidents: Robert W. Record, William P. Ayers, and Harold N. Goodspeed.

Tuxedo Candy Co. division of Safeway Stores, Inc., will start production in former Clapp Baby Food plant of American Home Foods, Inc., at San Jose, Calif.

Ward Baking Co. has acquired **Made-Rite Bakery, Inc.**, of Rocky Mount, N. C.



Charles W. Kaufman, vice-president and director of research of Kraft Foods Co., has been named a director. He has also been associated with General Foods and National Canners Assn.



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Aspics
Beer
Beverages
Cake Icings
Canned Fish and Meat
Canned Fruit
Canned Poultry
Cheese Spreads
Chocolate Milk
Chocolate Syrups
Confectionery
Dehydrated Soups
Dessert Mixes
Flavoring Emulsions
French Dressing
Frozen Fish
Frozen Fresh Fruit
Frozen Fruit Juices
Fruit Fillings (Pie)
Fruit Juices
Glazes
Ice Cream
Marshmallow Toppings
Meringues
Milk Puddings
Pet Foods
Pie Fillings
Pie Mix (Prepared)
Pumpkin Pie Mix
Ripple Ice Cream
Salad Dressings
Sausages
Sauces (Prepared)
Sherbets
Soups
Syrups
Water Gel Desserts
Whipped Cream

..AND YOUR IMPROVEMENT PROBLEM HERE?

- ☐ Binding
- ☐ Bodying
- ☐ Emulsifying
- ☐ Gelling
- ☐ Modifying
- ☐ Stabilizing
- ☐ Suspending
- ☐ Thickening
- ☐ Custardizing milk & products containing milk solids
- ☐ Improving mouth-feel and flavor
- ☐ Increasing efficiency of component ingredients
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- ☐ Physical & anti-oxidant protection
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Whether your problem is an old story or "different from anyone else's", chances are SeaKem "Colloids Out of the Sea" and Seaplant Chemical's confidential laboratory service, can mean time and money to you. Fill out and mail coupon today for prompt attention.

*SeaKem is the trademark for the standardized, water-soluble, sea plant extractives manufactured by the Seaplant Chemical Corporation. Refined by rigidly controlled processes which insure dependable uniformity and purity, SeaKem "Colloids Out of the Sea" are light amber to colorless, free-flowing flaky powders. Available in a variety of types suitable for use in an unusually wide range of food applications (see lists above), SeaKem Products have won acceptance on the basis of proven advantages with leading manufacturers and processors.

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PERFECT MIXES EVERY TIME . . .

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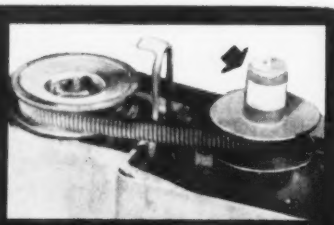
***Variable Speed* PULLEY**
PROVIDES POSITIVE, ACCURATE SPEED CONTROL

Rugged loading conditions are no problem for this heavy-duty vertical Food Mixer made by G. S. Blakeslee & Co., Chicago, Ill. Equipped with Roto-Cone variable speed pulley drive, the mixing speed can be changed infinitely within a 4 to 1 ratio without stopping mixing action. Speed adjustment is made with convenient handwheel.

Investigate the advantages of adding ROTO-CONE variable speed to your present drive. The Roto-Cone line, easily installed, is complete . . . variable speed pulleys, adjustable motor bases, V-belts, and V-driven sheaves. All tested and proved in thousands of actual installations in the food processing field.

Write for descriptive literature and request the assistance of our speed control engineers.

V TO V DRIVE
Outstanding with ROTO-CONE



Note the versatile mounting (vertical) and compactness. V-belt always travels on fixed center line as axial disc movement on variable speed pulley is equal and opposite.

GERBING MANUFACTURING CORPORATION
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Howard G. Wascher, chairman of Corn Products Refining Co.'s executive committee, is new president of Corn Industries Research Foundation, Inc., of New York and Washington. He succeeds the late Morris Sayre.

Washington Brewery, Inc., of Columbus, Ohio, is now controlled by Hobell Industries, Cincinnati investment group.

Welch Grape Juice Co. has purchased the **Church Grape Juice Co.,** Kennewick, Wash., and will build a $350,000 cold storage addition to its Grandview, Wash., plant.

Personnel

Taylor S. Abernathy, president of First National Bank of Kansas City, Mo., is newly elected director of Sunshine Biscuits, Inc., Long Island City, N. Y.

J. Linwood Antrim, Jr., has been named vice-president of Southern Coffee Roasters Assn.

William P. Ayers has been appointed a vice-president of Swift & Co., and will head the company's dairy, poultry, and ice cream departments.

N. L. Bosworth is new vice-president and board member of Canada Dry Ltd., Toronto, Ont.

Frederick McG. Bundy of Gloucester, Mass., recently was elected president of National Fisheries Institute.

Allison S. Burhans has been named director of research and development for Beech-Nut Packing Co.

Horacio Cintra Leite has been appointed head of Brazilian Coffee Institute's New York office.

Edmund A. Mirrassou, co-owner of Mirassou Vineyards, San Jose, Calif., has been elected chairman of Wine Advisory Board of California.

George Neel, formerly with Western Research Laboratory, has joined food processing division of J. R. Simplot Co.

L. C. Post has been named assistant vice-president of Borden Co.'s Pioneer Ice Cream Div.

G. C. Pound, president of Kraft Foods Co., subsidiary of National Dairy Products Corp., has been elected a vice-president of parent company.

David Rascoff, president of Hammer Beverage Corp., has been elected president of New York State Bottlers of Carbonated Beverages, Inc.

Arthur L. Ruffing has been appointed manager of Norwalk division of Durkee Famous Foods division of Glidden Co.

Dr. Harold W. Schultz, head of two research divisions for Swift & Co. research laboratories in Chicago, is new head of food technology department at Oregon State College.

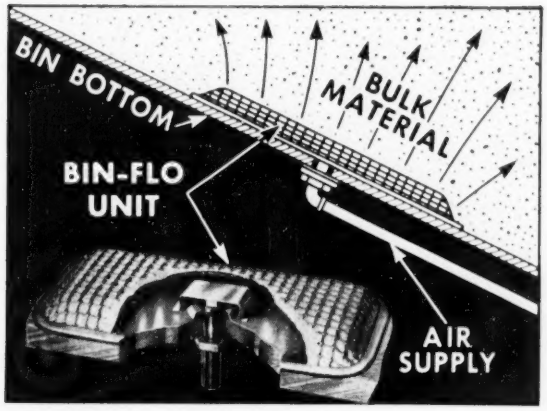
Herbert N. Stevens, seafood product manager of General Foods Corp.'s Birds Eye Division, has been elected a director and executive committee member.

Grover D. Turnbow, has been elected president and general manager of Foremost Dairies, Inc.

Merrill N. Warnick has assumed presidency of American Dairy Assn.

Donald G. Wilson has been appointed general manager of George H. Lyon & Son, fish packing firm.

Albert R. Fleischmann, vice-president and general sales manager of Standard Brands Inc., has been elected a director. He has been with company for 37 years.



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BIN-FLO units in bins, chutes, hoppers, etc., restore flow characteristics to dry, finely ground materials which tend to pack or bridge in storage. Types for all materials and conditions. No moving parts; simple installation; negligible operating cost; no maintenance cost.

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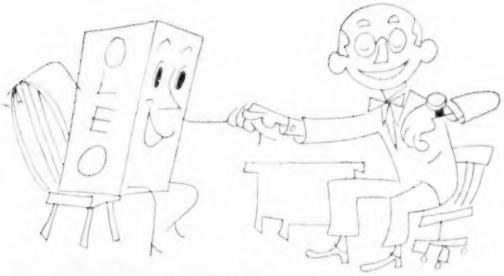

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Oleo Oil

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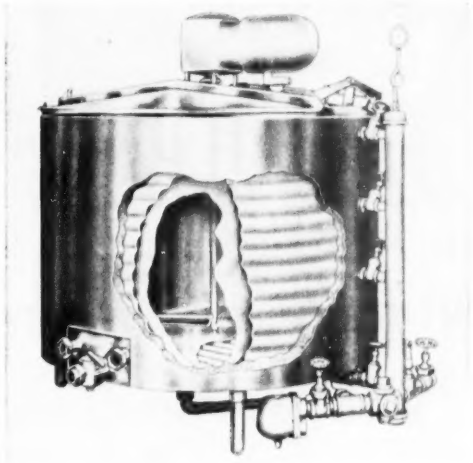
HEAT AND COOL Without Pumping

● The problem of handling viscous or macerated food products that must be heated and cooled in bulk, but are poorly adapted to pumping through separate coolers can be solved with Mojonnier Vats, because they combine fast heating and cooling in one stainless steel vessel.



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GENERAL OFFICES
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*T.M. REG. U. S. PAT. OFF.

Harold Wainess has opened Chicago offices as milk and food consultant. He is former chief sanitary officer of Chicago Health Dept., and is on leave of absence from his duties as regional food and milk consultant of the U. S. Public Health Service.

Don B. Wood, owner and president of Wood Canning Co., Stockton, Calif., has been re-elected president of Canners League of Calif.

W. A. Yantis has been elected president of Chase Candy Co.

Walter V. Yonker has been placed in charge of canned seafood inspection operations in Seattle for National Canners Assn.

Associated Industries

Acme Steel Co., Chicago, has announced appointment of Marsh B. Hall as chief engineer and Willard S. Collins as assistant chief research and development engineer.

American Can Co. has proposed Needham, Mass., as site of paper milk container plant.

American Machine & Foundry Co. has added two new directors to its board: Rodney C. Gott and Murray McConnel.

American Plastics Corp. has purchased reinforced plastics division of Heyden Chemical Corp.

Barber-Colman Co. of Rockford, Ill., will open new factory branch in Columbus, S. C.

Cherry-Burrell Corp. has elected D. H. Burrell, III as vice-president of operations, succeeding retiring Carl A. Wood.

Container Corp. of America has opened new folding carton plant at Oaks, Pa.

Continental Can Co.'s two newly elected vice-presidents are John G. Murray and Peter P. Wojtul.

Dobeckmun Co.'s president, Thomas F. Dolan, was recently honored with a plaque from company personnel, celebrating cellophane packaging firms 25th anniversary.

Food Machinery & Chemical Corp. has acquired controlling interest in Varley Pumps & Engineering Limited of Brentford, England.

Lamson Corp., Syracuse, N. Y., has appointed Verne C. Story as manager of field operations.

Marathon Corp.'s vice-president, Allen Abrams, has been elected president of Industrial Research Institute, Inc. of New York.

Owens-Illinois Glass Co., Toledo, plans construction of large bottle plant in Atlanta.

Paterson Parchment Paper Co.'s new president is E. R. Leonard.

Raybestos-Manhattan, Inc., Passaic, N. J., will open new modern rubber roll covering plant at Neenah, Wis.

Refrigeration Equipment Manufacturers Assn. has elected L. C. McKesson as president and Lud Emde as vice-president.

Schmidt Lithograph Co. of San Francisco has announced establishment of new gravure-printed foil packaging department.

Union Carbide & Carbon Corp. has elected Howard S. Bunn as vice-president.

Deaths

James Oliver Deegan, 58, president of Anchor Cap & Closure Corp. of Canada, Ltd., and a director of Anchor Hocking Glass Corp.—Apr. 4.

Malcolm McFaull, 66, former vice-president and treasurer of Standard-Knapp Corp., packaging equipment manufacturers.—Apr. 30.

Leonard W. Pollack, 59, partner of Fletcher & Pollack.—May 10.

George A. Smith, 38, owner of Fresno Meat Packing Co., Fresno, Calif.—Apr. 14.

Paul Wormser, 60, vice-president of S & W Fine Foods.—Mar. 23.

For High Speed

CONTAINER CASING

The Model B Caser is designed for high-speed casing operations as it automatically loads two tiers at a time, with either right or left-hand or two-side delivery. When equipped for two-side discharge it can fill up to 24 cases per minute. Recommended for a range of 202 to 501 diameters up to 512 heights.

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● cheap and easy to install ● lightweight ● moisture-proof . . . no swelling, softening or freezing ● efficient . . . K factor of .23 to .27 ● sanitary . . . no rot, drip or mold ● odorless and non-toxic ● vermin-resistant

Vapo-Wall pipe insulation, made of **Styrofoam,** is the ideal covering for all low-temperature lines. Immediate shipment on all common sizes of pipe and fitting covers. Can be installed with good results, even on wet lines, by your own maintenance crew. Write for free booklet and price information.

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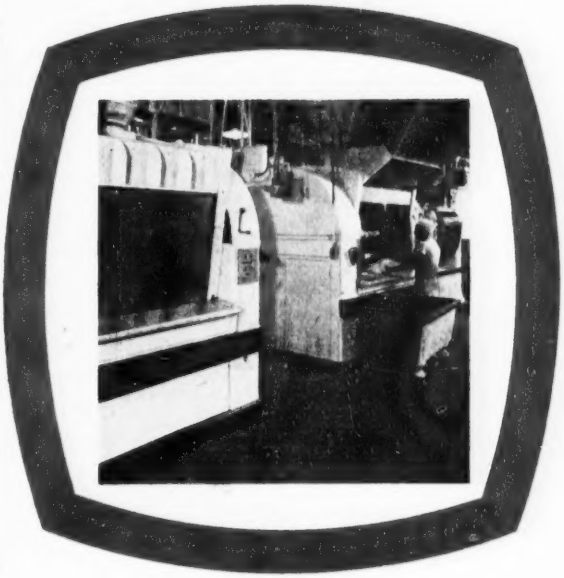

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ROCKFORD, ILLINOIS

A DOLE "Ice-Cel" Unit is employed here with an ammonia compressor hook-up to supply chilled water for the cooling heads on the dough mixers. In conjunction with a water cooling coil this unit keeps an even temperature in the fermentation room . . . *No water loss, all water being re-circulated.*

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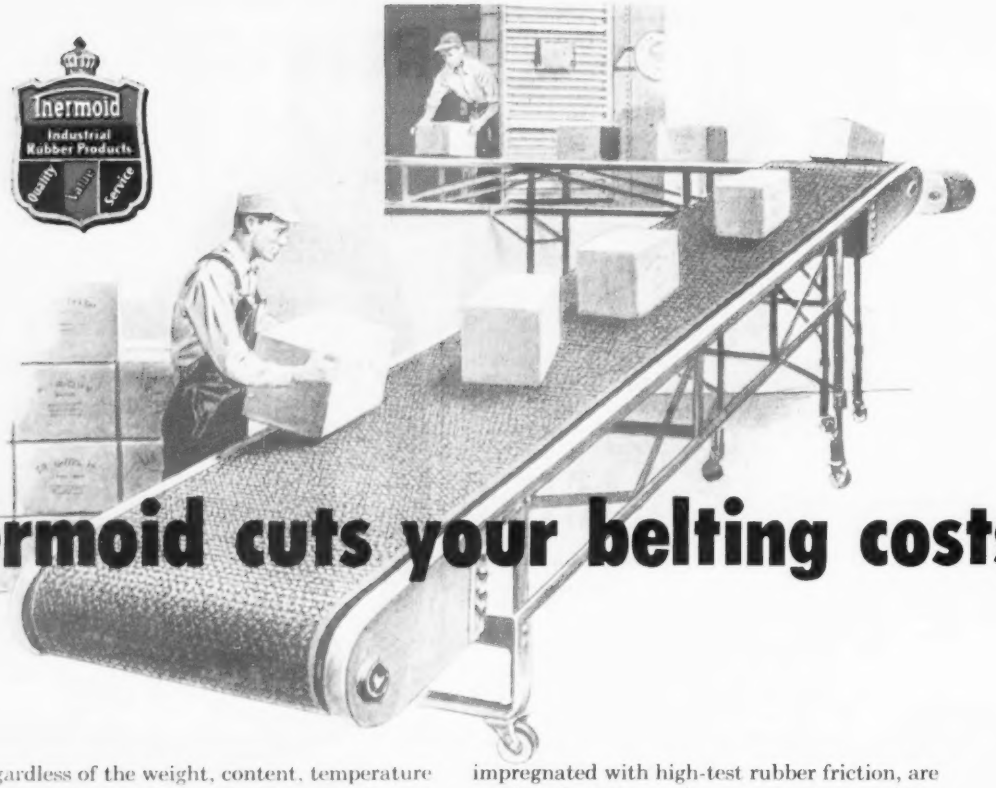
Maximum Refrigeration Efficiency

DOLE

"ICE-CEL" UNITS

For more information, use coupon on page 201.



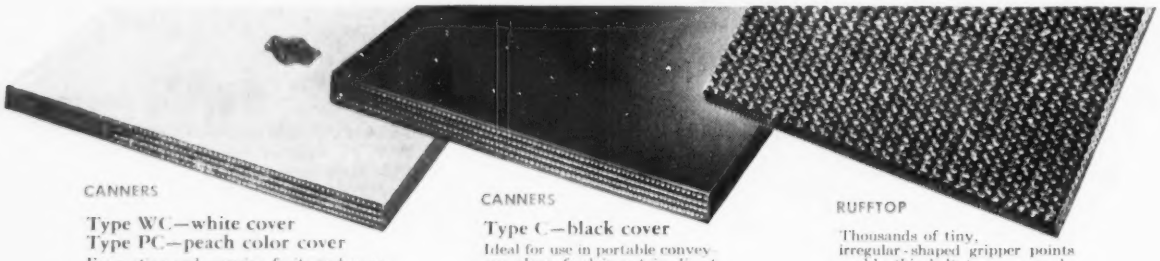
Thermoid cuts your belting costs

Regardless of the weight, content, temperature or other characteristics of the materials you handle, there's a Thermoid Conveyor Belt that will stay on the job longer, reducing your handling costs.

Thermoid "built-for-the-job" Conveyor Belts, like those shown below are providing maximum service for leading processors and packers, coast to coast. Strong cotton fabrics, thoroughly impregnated with high-test rubber friction, are combined with tough, wear-resistant rubber covers. Welded together under extremely high pressures to assure exceptionally strong, durable belting.

Your Thermoid Distributor can help you select the belt best suited to your needs. If your problem is unusual, he'll call an experienced Thermoid Sales Engineer.

Thermoid Belting specifically designed for food processing applications:



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Type WC—white cover
Type PC—peach color cover

For sorting and carrying fruits and vegetables. Acid-resistant. Imparts no odor or taste to food.

CANNERS

Type C—black cover

Ideal for use in portable conveyors where food is not in direct contact with belt. For handling packages, refuse, or waste.

RUFFTOP

Thousands of tiny, irregular-shaped gripper points enable this belt to carry packages up inclines of 30-35° with no backslip.

Write for Thermoid Conveyor Belting Catalog #3679, containing full engineering data.

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Just Off the Press

New Catalogs and Bulletins
from manufacturers of equipment and supplies
—Free For The Asking—

Food Plant Equipment

Pipeline Filter

Illustrated leaflet covers advantages of four low pressure pipeline filter models.—*Dollinger Corp., 11 Centre Park, Rochester 3, N. Y.*

Circle 251A on Reader Service Card

Sand Pumps

Arguments for efficiency of pressure molded rubber parts in rubber-lined sand pumps are offered in Bulletin P9-BS. 20 pages.—*Denver Equipment Co., 1400 17th St., Denver.*

Circle 251B on Reader Service Card

Power Conversion

Design features, advantages, performance and dimensions of metallic rectifier power conversion units are listed in bulletin. 8 pages.—*General Electric, Schenectady 5, N. Y.*

Circle 251C on Reader Service Card

Centrifugal Pumps

Bulletin O8B6146B deals with line of single stage, double suction centrifugal pumps. 24 pages.—*Allis-Chalmers Mfg. Co., 1113 S. 70th St., Milwaukee.*

Circle 251D on Reader Service Card

Industrial Valves

Catalog covers series of valves for use where ammonia and other gases non-corrosive to steel are used. 16 pages.—*Henry Valve Co., Melrose Park, Ill.*

Circle 251E on Reader Service Card

Valve Handwheel

Circular covers unusual design features and advantages of new valve handwheel.—*Lunkenheimer Co., Cincinnati, O.*

Circle 251F on Reader Service Card

Pre-Vacuumizing Syruper

Specifications and photos of pre-vacuumizing syruper are presented in leaflet.—*Food Machinery & Chemical Corp., San Jose 6, Calif.*

Circle 251G on Reader Service Card

Jacketed Fittings

Line of cast iron and cast steel jacketed fittings are dealt with in booklet.—*Red Jacket Co., Inc., Investment Bldg., Pittsburgh 22.*

Circle 251H on Reader Service Card

Dust Collectors

Self-cleaning cloth screen dust collectors are featured in Bulletin 915. 6 pages.—*Pangborn Corp., Hagerstown, Md.*

Circle 251I on Reader Service Card

V-Belt Data

Fractional horsepower V-belt catalog is for use in servicing light duty applications.—*Raybestos-Manhattan, Inc., Passaic, N. J.*

Circle 251J on Reader Service Card

Water Conditioner

Industrial uses of water and fluid conditioner are discussed in leaflet.—*Evis Mfg. Co., 40 Boardman Pl., San Francisco 3.*

Circle 251K on Reader Service Card

Electric Dehumidifiers

Illustrated folder explains heavy duty electric humidifiers.—*Remington Air Conditioning, Auburn, N. Y.*

Circle 251L on Reader Service Card

Hydraulic Pumps

Engineering data book contains technical information and drawings of new line of heavy duty hydraulic pumps and motors.—*Waterbury Tool, Waterbury 20, Conn.*

Circle 251M on Reader Service Card

Self-Cleaning Purifier

Longer life for reciprocating engines is one of advantages of internal type self-cleaning purifier quoted in leaflet.—*V. D. Anderson Co., 1935 W. 96th St., Cleveland 2.*

Circle 251N on Reader Service Card

Non-Electric Magnets

Bulletin B-603 deals with use of permanent non-electric plate magnets in removal of tramp iron and prevention of product contamination. 4 pages.—*Eriez Mfg. Co., Erie, Pa.*

Circle 251O on Reader Service Card

Industrial Heaters

Complete information on standard and heavy-duty centrifugal fan industrial heaters is contained in Catalog 1510. 32 pages.—*Westinghouse Sturtevant Div., 200 Readville St., Hyde Park, Boston 36.*

Circle 251P on Reader Service Card

Backstopping Clutches

Applications and engineering data dealing with over-running, indexing and backstopping clutches are presented in folder.—*Formsprag Co., 23601 Hoover Road, Van Dyke, Mich.*

Circle 251Q on Reader Service Card

Starter Selection

Bulletin 14B7733 contains information for selection of right starter for squirrel-cage induction motors. 4 pages.—*Allis-Chalmers*

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$92.50
Slightly higher west of Mississippi and in Canada
FOGS 1000 CU. FT. IN 10 SECONDS

● A deadly weapon against germs and insects is an aerosol fog. Its microscopic particles penetrate the smallest cracks and holes, settle lethal doses of insecticides in the darkest corners, where vermin nest. Ordinary sprayers can not do this because the particles are too large. To produce an aerosol fog efficiently and economically, use the MICROSOL® 202. This mechanical fog generator does not use heat or steam (which disintegrate some insecticides). No need for awkward attachments like nozzles and air compressors. The MICROSOL® 202 is entirely portable . . . light, sturdy, easy to operate, no maintenance. Do your exterminating with the MICROSOL® 202. Use it anywhere! Use any kind of liquid germicide, insecticide, deodorant, or humidifier! Use it and see the difference! MICROSOL® units available in many sizes and with many capacities. Ask your insecticide dealer or write for more complete information.

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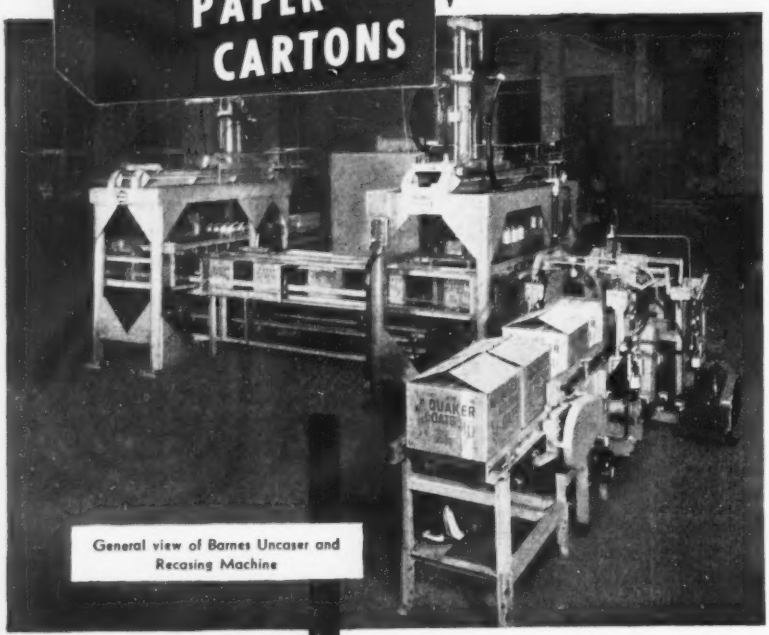
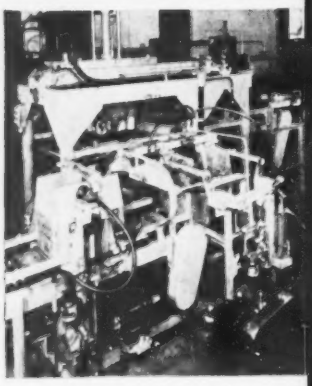
IF YOU USE PAPER CARTONS

Investigate This Barnes Uncaser and Recasing Machine



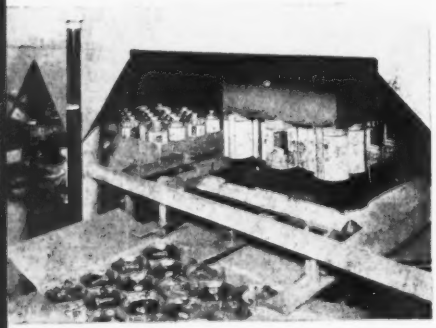
General view of Barnes Uncaser and Recasing Machine

This new magnetic Uncasing and Recasing machine unloads and reloads 200 cartons per hour. Each carton holds 36 cans. Paper cartons of empty cans are conveyed to the flap opening station where one pair and then the other pair of flaps are opened by vacuum lifters. The carton is then transferred to position under a rectangular magnet which lifts the cans out onto a belt conveyor. There are two layers of cans in a carton so the magnet operates twice for each carton.



View showing vacuum lifters

The belt conveyor moves the cans to an "unscrambler" which delivers them single-file to the filler. After filling, the cans are conveyed back to the machine for recasing.



Detailed view of reloading station

FREE ADDITIONAL DATA on this and other Barnes Processing equipment is available upon request. Ask for bulletin E-653. •

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ASEPTIC CANNING CREAM STYLE CORN

The Martin Aseptic Canning System offers a means of eliminating the processing in the can by taking advantage of short-time high-temperature sterilization of the product in a closed heat exchange system and filling it cold into a sterile can.

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Attractive features of the Martin System include continuous straight-line flow of both the product and the cans, low utility requirements, small space requirements, low manpower costs, and improved flavor, color and quality in the finished product. One feature of particular interest is the fact that because the corn was processed outside of the can, the finished canned product has identical quality regardless of size of container used.

CARMELIZED TINT ELIMINATED

Test cuttings of the Aseptic pack show that the product produced by this method has a vast improvement in color by eliminating the characteristic brown or carmelized tint found in present in-the-can processed cream style corn.

Two papers were delivered at the Canning Machinery & Supplies Association Convention recently. These papers offer additional information on Aseptic Canning and are available upon request. Write to W. F. and John Barnes Company, 301 South Water Street, Rockford, Illinois.

Mfg. Co., 1113 S. 70th St., Milwaukee 1.

Circle 253A on Reader Service Card

Pumping Units

Automatic pumping unit featuring automatic centralized lubrication system is subject of Bulletin 39. 4 pages.—*Farval Corp., 3249 E. 80th St., Cleveland 4.*

Circle 253B on Reader Service Card

Steel Fabrication

Bulletin 153 covers line of engineered stainless steel fabrications, giving special attention to tanks. —*Rodney Hunt Machine Co., 53 Mill St., Orange, Mass.*

Circle 253C on Reader Service Card

Helical Gear Drives

Advantages of helical gear drives, fields of application, and correct selection are discussed in Book 2451. 16 pages.—*Link-Belt Co., 307 N. Michigan Ave., Chicago 1.*

Circle 253D on Reader Service Card

Automatic Boilers

Illustrated booklet contains detailed engineering data and specifications of line of automatic boilers. 4 pages.—*Boiler Engineering & Supply Co., Inc., Phoenixville, Pa.*

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Heat Exchangers

Advantages of wide variety of air-cooled heat exchangers are quoted in Bulletin FF-FD-0.001. 12 pages.—*Fluor Corp., Ltd., 2500 S. Atlantic Blvd., Los Angeles 22.*

Circle 253F on Reader Service Card

Variable Speed Drive

Bulletin V-532 presents dimensions and photos of newly designed variable speed drive. 4 pages.—*Reeves Pulley Co., Columbus, Ind.*

Circle 253G on Reader Service Card

Pressure Reduction

Improved pressure reducing valve that features sliding gate, is covered in booklet. 6 pages.—*Jordan Regulator Corp., Lebanon, O.*

Circle 253H on Reader Service Card

Grease Interception

Technical guide to proper sizing and selection of grease interceptors is illustrated.—*J. A. Zurn Mfg. Co., Erie, Pa.*

Circle 253I on Reader Service Card

Agitator Drives

Vertical agitator drive units for application in food processing agitator tanks is treated in bulletin. —*Western Gear Works, 417 9th Ave. S., Seattle 4.*

Circle 253J on Reader Service Card

Control Equipment

Automatic Controller

Technical information sheet covers operation of automatic elapsed time controllers.—*Foxboro Co., Foxboro, Mass.*

Circle 253K on Reader Service Card

Precision Scales

Scale for use where extreme precision in weighing is desired is subject of brochure.—*Detecto Scales Inc., 540 Park Ave., Bklyn. 5.*

Circle 253L on Reader Service Card

Solenoid Valves

Control of light and heavy liquids, gases, chemicals and foods with stainless steel solenoid valves is discussed in Bulletin 6100.—*R. G. Laurence Co., 43 Highwood Ave., Tenefly, N. J.*

Circle 253M on Reader Service Card

Millivoltmeter Instruments

Catalog 1053 covers use of Millivoltmeter-type indicating, electronic control, and safety shut-off instruments. 22 pages.—*Minneapolis-Honeywell Regulator Co., Wayne & Windrim Aves., Philadelphia 44.*

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Pressure Regulators

Bulletin 4003 features line of pressure regulators, offering performance curve data. 8 pages.—*Moore Products Co., Philadelphia 24.*

Circle 253O on Reader Service Card

Laboratory Equipment

Full line of lab equipment and supplies are contained in booklet. 20 pages.—*Burrell Corp., 2223 Fifth Ave., Pittsburgh 19.*

Circle 253P on Reader Service Card

Liquid-Level Valves

Data units feature liquid-level gage valves for both tubular and flat gages.—*Jerguson Gage & Valve Co., 80 Fellsway, Somerville 45, Mass.*

Circle 253Q on Reader Service Card

Spectrophotometers

Bulletin 303-18 contains detailed descriptions and illustrations of ultra violet and visible spectrophotometers. 28 pages.—*Beckman Instruments, Inc., South Pasadena 1, Calif.*

Circle 253R on Reader Service Card

Flow Regulation

Line of automatic weighing scales which integrate and regulate flow of materials are discussed in bulletin. 8 pages.—*Sintering Machinery Corp., Sinter Ave., Netcong, N. J.*

Circle 253S on Reader Service Card

Electronic Control

Single-thyratron electronic liquid-level control operating without radio frequency from a single probe is subject of brochure.—*Thermo Instruments Co., 1166 El Camino Real, Belmont, Calif.*

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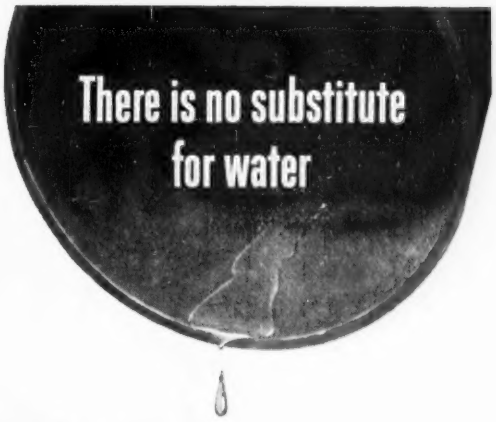

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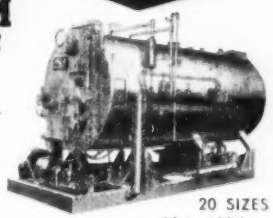

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Filter Papers

Bulletin 16 deals with complete line of industrial filter papers in rolls, sheets, circles, and special shapes.—*Brosites Products Corp., 50 Church St., New York 7.*

Circle 255A on Reader Service Card

Quartz Spectrophotometer

Bulletin 18F offers case studies and analyses derived from use of quartz spectrophotometer.—*Beckman Instruments, Inc., South Pasadena 1, Calif.*

Circle 255B on Reader Service Card

Materials Handling

Box Packing

How to Pack It describes line of corrugated boxes and their uses. 30 pages.—*Hinde & Dauch Paper Co., Sandusky, O.*

Circle 255C on Reader Service Card

Unloading Equipment

Bulletin 253 features photos, diagrams and performance data on series of equipment for loading or unloading cars and ships. 24 pages.—*Stephens-Adamson, Mfg. Co., Aurora, Ill.*

Circle 255D on Reader Service Card

Lightweight Equipment

Aluminum construction materials handling trucks and accessories are subject of catalog.—*Tobey Mfg. Corp., 1221 El Segundo Blvd., El Segundo, Calif.*

Circle 255E on Reader Service Card

Cellophane Characteristics

Colorful leaflets explain production, history, uses and applications of cellophane.—*Sylvania Div., American Viscose Corp., 1617 Pennsylvania Blvd., Phila. 3.*

Circle 255F on Reader Service Card

Conveyor Belts

Advantages of woven wire conveyor belts are discussed in Bulletin 105. 4 pages.—*Cambridge Wire Cloth Co., Cambridge, Md.*

Circle 255G on Reader Service Card

Pneumatic Conveying

Diagrams and sketches detailing industrial use of pneumatic conveying systems are contained in Bulletin 104. 8 pages.—*Convair, 712 Brookline Blvd., Pittsburgh.*

Circle 255H on Reader Service Card

Fork Lift Trucks

Circular covers series of fork lift trucks.—*Safeway Industrial Equipment Corp., 184 N. Franklin St., Chicago.*

Circle 255I on Reader Service Card

Bulk Handling

Automatic system for filling, transporting, storing, discharging, weighing and blending bulk materials is described in catalog. 16 pages.—*Tote System, Inc., Beatrice, Nebraska.*

Circle 255J on Reader Service Card

Pallet Trucks

Comparison charts cover hand propelled hydraulic pallet trucks.—*Lewis-Shepard Products, Inc., 125 Walnut St., Watertown, Mass.*

Circle 255K on Reader Service Card

Heavy-duty Trucks

Series of cab-over-engine trucks, both gasoline and diesel powered, are presented in catalog. 6 pages.—*Mack Motor Truck Corp., 350 Fifth Ave., New York 1.*

Circle 255L on Reader Service Card

Plant Supplies

Soy Derivatives

Booklet lists line of corn and soybean products for use in food processing. 16 pages.—*A. E. Staley Mfg. Co., Decatur, Ill.*

Circle 255M on Reader Service Card

Industrial Flooring

Surfacing old floors with brick without interrupting production is explained in brochure. 8 pages.—*Drehmann Paving & Flooring Co., 3757 S. Halsted St., Chicago 21.*

Circle 255N on Reader Service Card

Cannery Operation

Pamphlet concerns speeding production, and simplifying handling in canneries.—*Cambridge Wire Cloth Co., Cambridge, Md.*

Circle 255O on Reader Service Card

Bactericide-Fungicide

Application of peracetic acid, a new bactericide-fungicide, in food industry is dealt with in booklet.—*Buffalo Electro-Chemical Co., Inc., Becco Sales Corp., Buffalo 7.*

Circle 255P on Reader Service Card

Paint Maintenance

Pamphlet covers reduction of maintenance paint costs through new odorless paint.—*Enterprise Paint Mfg. Co., 2841 S. Ashland Ave., Chicago.*

Circle 255Q on Reader Service Card

Flavor Formulas

Formula and directions for manufacturing and industrial use of flavors are offered in booklets.—*Dodge & Olcott, Inc., 180 Varick St., New York 14.*

Circle 255R on Reader Service Card

Power Saw

Cutting tubing with newly designed power cut-off saw is subject of leaflet.—*Tri-Clover Machine Co., Kenosha, Wis.*

Circle 255S on Reader Service Card

Corrosion-Resistant Gasketing

Complete technical data on line of corrosion-resistant gasketing is offered.—*U. S. Stoneware, Akron 9.*

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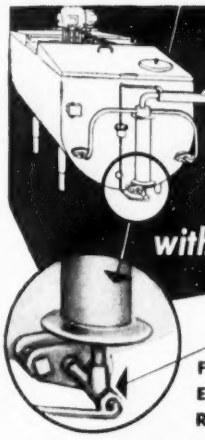

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FOR FLOODED REFRIGERATION EVAPORATORS USING RE-CIRCULATED FREON . . .

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ALSO brings operating economies to fan coolers, plate-type direct-expansion coolers, ice accumulators for sweetwater cooling, hardening-room blower units, pipe coils and pipe stands.

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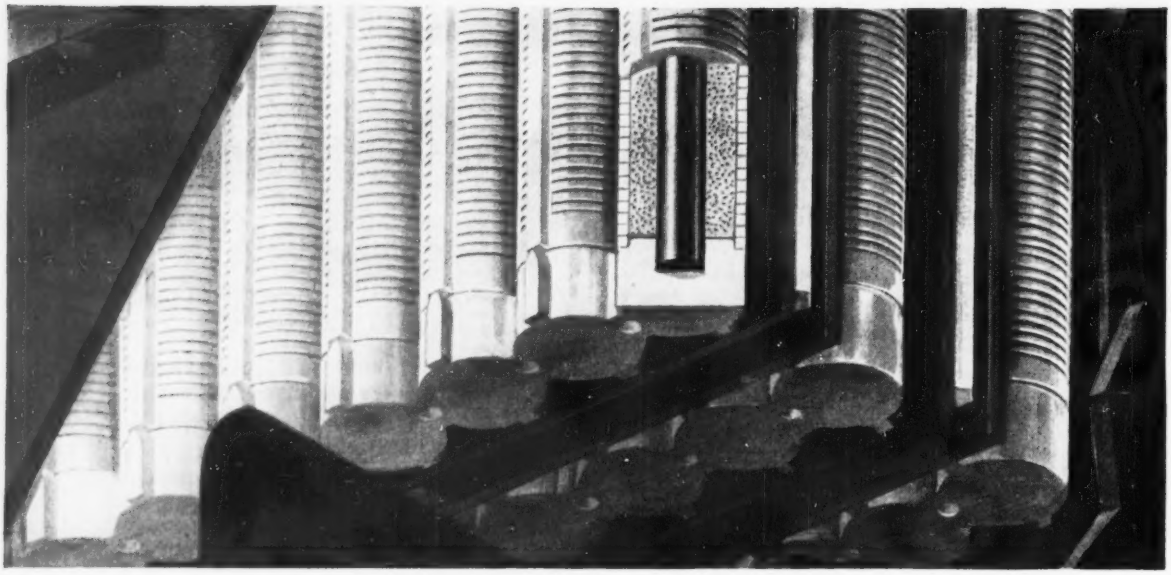
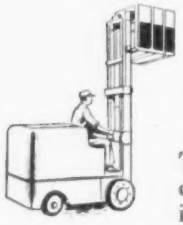


For industrial trucks... Exide-Ironclad now offers



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Its larger positive plates, containing corrosion-resistant Silvium, are different . . . unique . . . exclusive! No other type of positive plate construction offers you the advantages of the T-H Exide-Ironclad, with its slotted plastic tubes, permanently sealed on the bottom with polyethylene tube sealer. More active material is exposed to the electrolyte, resulting in greater power. More active material is retained, providing higher battery capacity for a longer working life.

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Lubrication Principle

Employing petroleum as a vehicle rather than the primary lubricating agent is new concept in lubrication explained in bulletin. —*Imperial Oil & Grease Co., Inc., 6399 Wilshire Blvd., Los Angeles 48.*

Circle 257A on Reader Service Card

Rubber Parts

Bulletin 5201A1 summarizes production and design of line of custom molded rubber parts. 4 pages.—*Parker Rubber Products Div., 17325 Euclid Ave., Cleveland 12.*

Circle 257B on Reader Service Card

Synthetic Detergents

Compounding synthetic detergents through use of new surface active agent. 8 pages.—*Diamond Alkali Co., 122 E. 42nd St., New York 17.*

Circle 257C on Reader Service Card

Spray Painting

Catalog IE-E covers standard spray-finishing equipment for industrial use. 28 pages.—*DeVilbiss Co., Toledo 1.*

Circle 257D on Reader Service Card

Structural Plastic

Engineering data, including fabrication and design factors, physical strength and chemical resistance of new corrosion-proof structural plastic unplasticized, rigid polyvinyl is contained in Bulletin 9-1. 6 pages.—*Atlas Mineral Products Co., 37 Ash St., Mertztown, Pa.*

Circle 257E on Reader Service Card

Industrial Chemicals

Sorbitol, surfactants, mannitol, solid polyester resins, fatty acids, plasticizers, and activated carbons are listed in catalog. 8 pages.—*Atlas Powder Co., Wilmington 99.*

Circle 257F on Reader Service Card

Miscellaneous

Vault Doors

Fire protection of records through fireproof vault doors, is featured in Folder SC-728. 8 pages.—*Remington Rand Inc., 315 Fourth Ave., New York 10.*

Circle 257G on Reader Service Card

Desk Calculator

Handy folding, pocket-size card contains wide range of engineering conversion tables, abrasives sizes, and formulas.—*Pangborn Corp., Hagerstown, Md.*

Circle 257H on Reader Service Card

Switch System

Airtube automatic switch system is explained in Bulletin A-101-52. 4 pages.—*Lamson Corp., Syracuse 1, N. Y.*

Circle 257I on Reader Service Card

Adding Machines

Line of hand operated adding machines are described in leaflet. —*Remington Rand Inc., 315 Fourth Ave., New York 10.*

Circle 257J on Reader Service Card

Sanitation Surveys

Consulting service on preventive sanitation is explained in brochure. —*J. Carl Dawson & Assoc., St. Louis 21.*

Circle 257K on Reader Service Card

Testing Bureau

Eighty testing, inspecting, and analyzing services are listed in folder.—*American Standards Testing Bureau, Inc., 44 Trinity Place, New York 6.*

Circle 257L on Reader Service Card

Baking Formulas

Baking recipes featuring poppy and carroway seed are explained in booklet. 12 pages.—*American Spice Trade Assn., 82 Wall St., New York 5.*

Circle 257M on Reader Service Card

Diatomite History

Celite—The Story of Diatomite uses photos and drawings as well as text to trace development of diatomite. 28 pages.—*Johns-Manville Celite Div., 22 E. 40th St., New York 16.*

Circle 257N on Reader Service Card

Investment Analysis

Two booklets make available information on simple investment analysis to determine savings brought about by air conditioning. —*General Electric Co., Bloomfield, N. J.*

Circle 257O on Reader Service Card

Poultry Industry

Method of applying statistics to development of poultry is described in Application Report 80. 10 pages.—*International Business Machines Corp., 590 Madison Ave., New York 22.*

Circle 257P on Reader Service Card

Industrial Landscaping

Brochure treats with awards presented for landscaping and beautification of industrial buildings and property.—*American Assn. of Nurserymen, 635 Southern Bldg., Washington 5, D. C.*

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- ☐ Has your company given any recognition to donors?
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1—Shriver 18" x 18" Alum. Filter Press.
1—Patterson S.S. 110 gal. Vacuum Mixer, sigma blades.
4—Buflovac Atmo. Dbl. Drum Dryers, 32" x 72", 32" x 90", 42" x 120".
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1—N. J. Semi Auto. Labeler.

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Brewery Lining

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(3) 5,800 gal. Horizontal
(2) 6,600 gal. Vertical, open
(2) 3,500 gal. Vertical, open

AT TONAWANDA, N. Y.—Mammut lined:
(5) 7,000 gal. Vertical, closed

AT MOUNT CARMEL, PA.—Mammut lined:
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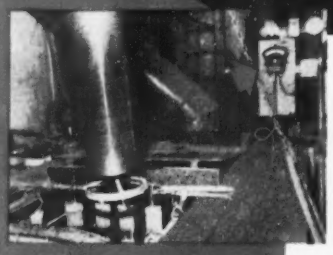
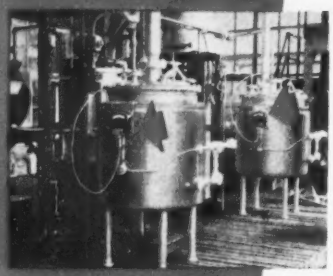


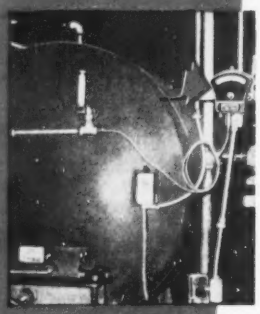
PLATING

In copper and chromium plating of rotogravure rolls, the temperature of plating solutions is held to within ½°F by Sarco Electric Indicating Temperature Controllers. Photo taken in Southern Gravure Service plant, Louisville, Ky.



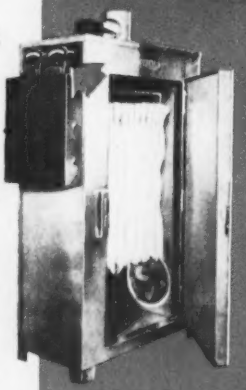
CHEMICAL

Hoffman La Roche Pharmaceutical Co., Nutley, N. J.—the jacket water temperature of these stills must be held to within ½°F. For the past 9 years, Sarco LSI Indicating Temperature Controllers have been doing that job.



FOOD

Chocolate milk and soft drinks in bottles and cans are processed in Fort Wayne Sterilizers. Many users equip these Sterilizers with Sarco LSI Electric Indicating Controllers to hold the temperature to within ½°F. Hook-up sketches and case histories on request.



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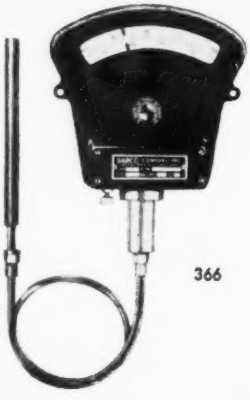
The Backus Hosiery Conditioner processes 15 denier nylon hosiery—40 dozen per 1 hour cycle. The humidity and dry heat are controlled by two Sarco Electric Indicating Temperature Controllers. Over 500 LSI's have been factory-installed on these Conditioners by Backus Machine Works, Carlstadt, N. J.

TYPE LSI

An extremely sensitive and accurate Electric Indicating Temperature Controller for temperatures from minus 90°F to plus 650°F. Controls electric heating elements, motors, solenoid or motor valves to maintain constant temperature.

A built-in thermometer makes setting easy and provides a continuous check on temperatures maintained without the bother of continually changing charts.

A double switch type L2SI is available for alternate heating and cooling control, or step control of heating or cooling.



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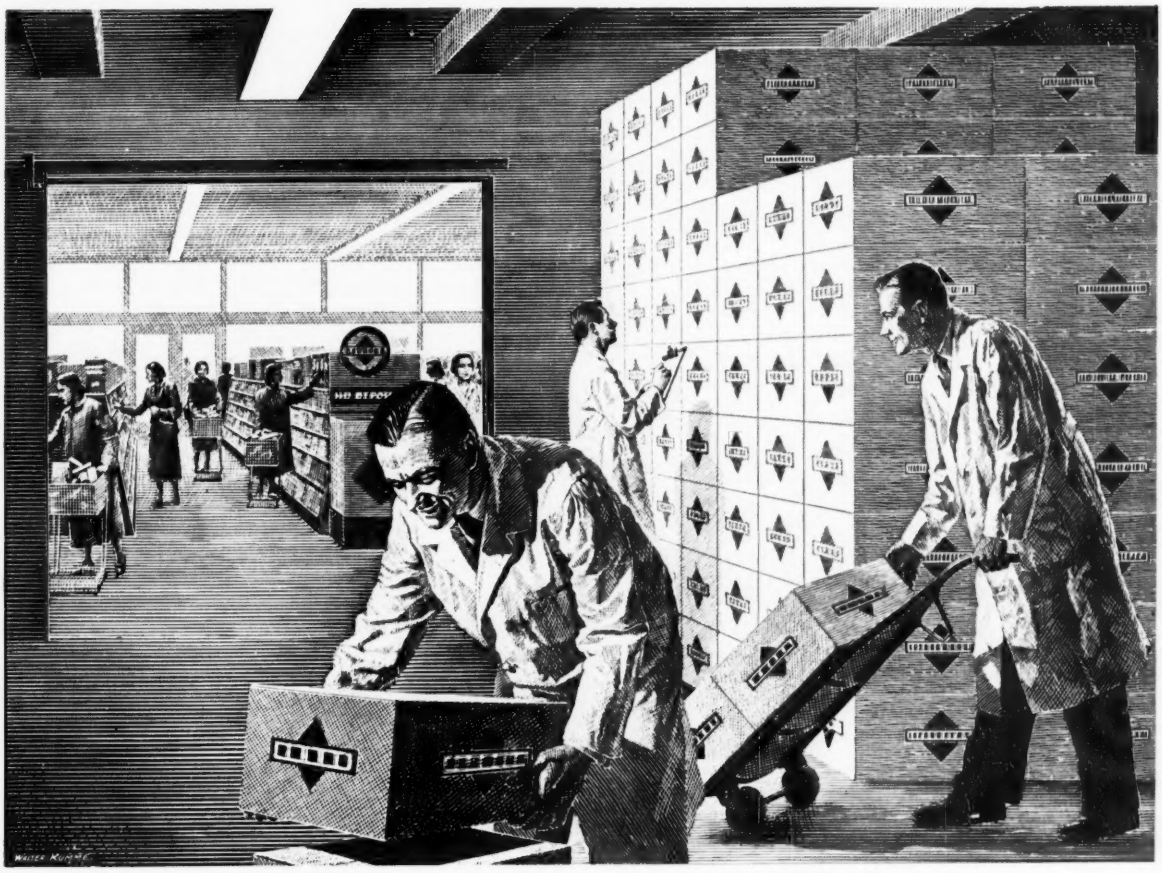


Your Product is Well-Dressed and "Sell-Dressed" in a Gaylord Container

Gaylord Boxes

Their unseen quality gives you an extra margin of safety.

Strikingly printed Gaylord shipping containers keep on selling your name and product wherever they go. This effective and economical medium is a natural to increase the impact of your advertising and other promotions.

Your nearby Gaylord sales representative will be happy to tell you more about these "traveling billboards." You will find him listed under Boxes (Gaylord) in the classified pages of your phone book.

GAYLORD CONTAINER CORPORATION

General Offices: ST. LOUIS • Sales Offices Coast-to-Coast

CORRUGATED AND SOLID FIBRE BOXES • FOLDING CARTONS • KRAFT BAGS AND SACKS • KRAFT PAPER AND SPECIALTIES

Technical data on the revolutionary new

holo-flite*

(HOLLOW-FLIGHT)

PROCESSOR

—the Continuous-Flow Heat-Exchanger that is setting new standards of

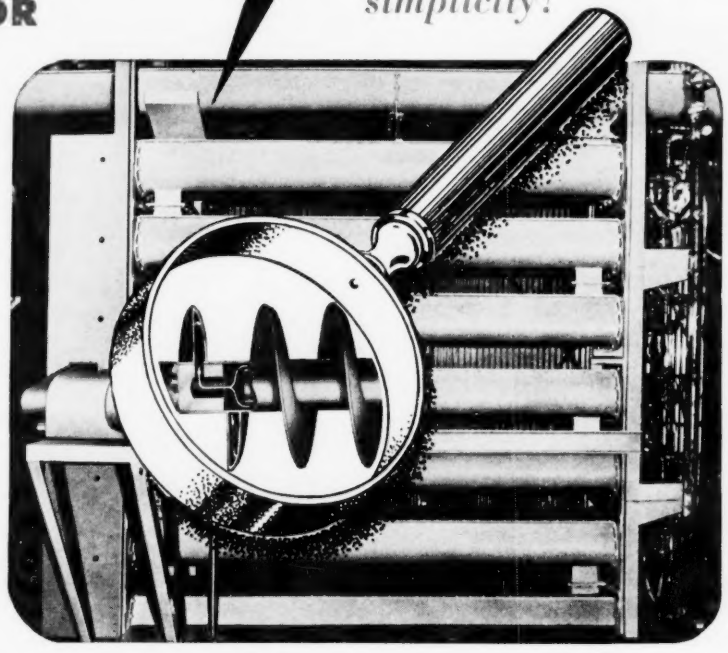
compactness!
adaptability!
simplicity!

If you have processing operations where slurries, solids, pulps or pastes must be cooled or cooked, be sure to investigate the many unique advantages of the newly-developed HOLO-FLITE Processor before you install *any* heat-exchange equipment.

Here's the HOLO-FLITE principle . . .

Two or more screw conveyors rotate slowly in a trough. The blades and shaft of each flight of conveyors are hollow, with provision for circulating the heat-transfer agent through them. The product to be cooled or cooked is moved along the trough, being constantly rotated into, around, over and under the conveyor screws as it moves.

Thus, a continuous thermal transfer takes place between the product and the heat-transfer fluid circulating in the blades. The product is cooled or cooked in *continuous-flow* without the "stop-and-go" losses of batching operations . . . and cooled products can be packaged directly from the HOLO-FLITE discharge—saving space, time and additional handling.



THIS 6-TIER HOLO-FLITE cools 7 tons of cottonseed press cake per hour from 285° to 89°F. *in a total floor space of only 28 sq. ft.* *(Insert)* Enlarged cutaway view of HOLO-FLITE screw showing heat-transfer principle.

Here are typical HOLO-FLITE advantages

The HOLO-FLITE principle is so unique it is setting completely new standards of performance in *many* ways. For example . . .

*Reg. T.M.

The HOLO-FLITE Saves Space—It requires as little as 1/5th the space of other units of comparable capacity because (1) it has far greater heat-transfer area per cubic foot of space . . . and (2) the flights can be "tiered" as high as desired to give maximum capacity in very small floor areas.

The HOLO-FLITE is Versatile—Processed product can be fluid, pulp or paste—granular, crystalline or powdered solid. Heat-transfer fluid can be refrigerant, cooled or ambient water, steam, oil or any other desired fluid, at any normal temperature range.

The HOLO-FLITE Is Dust-Free—Its gentle action provides large heat-transfer action without dust and with negligible particle abrasion. Simplifies installations, assures higher quality product.

The HOLO-FLITE Is Adaptable—It can easily be designed to handle virtually any capacity by (a) varying the diameter of the screws (7" to 16") . . . (b) varying the length of the screws (8 ft. to 20 ft.) . . . (c) varying the number of intermeshing screws per trough (2, 4, or 6) . . . and (d) varying the number of tiers stacked on top of one another (1 to 10, or more).

WESTERN Precipitation CORPORATION

ENGINEERS, DESIGNERS & MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS

Main Offices: 1016 WEST NINTH STREET, LOS ANGELES 15, CALIFORNIA
CHRYSLER BLDG., NEW YORK 17 • 1 N. La SALLE ST. BLDG., CHICAGO 2
1429 PEACHTREE ST. N.E., ATLANTA 5 • HOBART BLDG., SAN FRANCISCO 4
PRECIPITATION CO. OF CANADA, LTD., DOMINION SQ. BLDG., MONTREAL

The HOLO-FLITE is in daily operation on such typical products as sand, cement, cottonseed cake, soybean meal, borax, salt, sugar, baby foods and many other equally-varied products.

What is your problem? *Our engineers will be glad to assist you in making the most of* HOLO-FLITE *advantages. Write wire, or phone the office nearest you!*

Want More Facts? This 8 page booklet describing the HOLO-FLITE in greater detail will gladly be sent on request. No obligation, of course.